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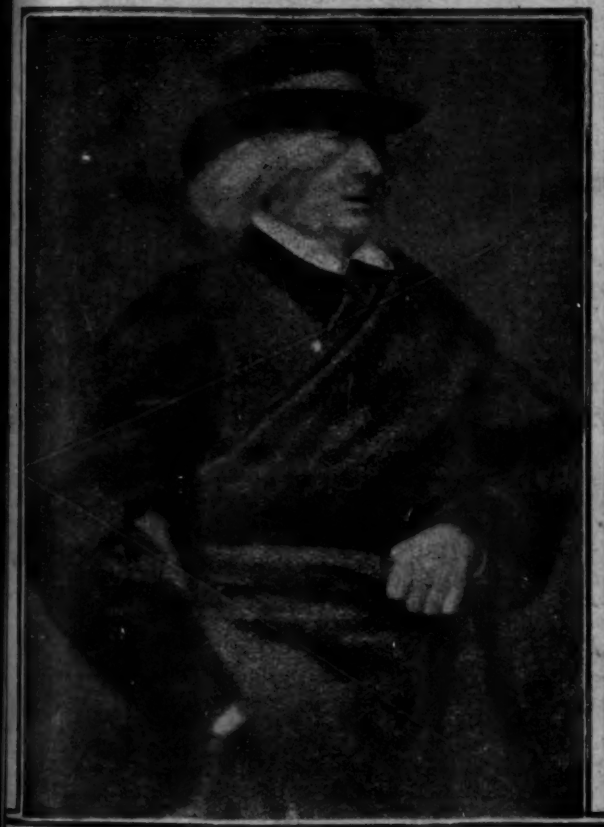
See page 271.

THE PRACTICAL TEACHER



JOHN STUART BLACKIE.

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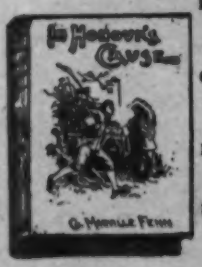

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Wisdom is humble that he knows no more.'—COWPER.

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BRUSH DRAWING.

(*See Supplement presented with this number.*)

BY J. VAUGHAN,
Art Master, School Board for London.

THE issue of the 'Alternative Drawing Syllabus,' by the Science and Art Department, and of the 'Special Circular (No. 374) on Manual Occupations,' by the Education Department, both strongly recommending brushwork as a means of education, has brought this subject very much to the front of late.

Brush drawing itself is not by any means a new subject ; it is, in fact, one of the most ancient forms of decoration. The old Egyptian, Greek, and Etruscan vases all furnish us with splendid examples of this kind of ornament, and it is now generally admitted that the so-called Greek honeysuckle owed its origin rather to the free play of the brush, than to the form of this particular flower. If you take a brush, well filled with colour, and begin to use it freely, and somewhat playfully, on a piece of paper, just as you may a pen or pencil, forms, such as the 'leaf' portion of Fig. 9, more or less artistic in shape, are sure to be the result. Naturally, however, much practice

FIG. 1.

and considerable skill are required to produce just the form which may be required.

From the first introduction of 'manual occupations,' or 'hand and eye training,' as we have called it, I have always had an idea that there were great possibilities, educationally, in the subject of brush drawing, and in various things that I have published, some mention has been made of it, and some few examples given. Recently I turned my attention specially

FIG. 2.

to the work, and arranged it in a progressive course from Standard I. upwards. The 'supplement' shows the barest possible skeleton of the scheme ; in so few examples, many vital points have of necessity to be left out. The intention of the present one, however, is to give just an idea of what the work is ; the separate stages can be dealt with fully later on.

The first practical step in the work is to make the simple brush impression, or 'blob,' as it is often called. This is done by well filling the brush with colour, and laying it flat on the paper. The brush should be held about half the way down the handle, so that the whole length of it may readily be brought into contact with the paper. There should be no movement of the brush when actually touching the paper. The resulting mass of colour is then an exact impression of the brush itself. The one aim in this stage is to give the children an idea of the nature of the tool they are using—how flexible its point compared with the pencil or pen they have used ; how it yields to the slightest pressure, and thus requires most careful handling.

Even this simple operation will need careful instruction, and in order to give the pupils some legitimate aid, and some definite aim to work to, squared paper should be provided. This should be with about one inch squares, as these are quite small enough for practical work. The squaring would, of

course, be continuous over the whole sheet of paper, and not broken as in the accompanying illustrations.

The "blobs" shown in these reduced exercises are generally rather larger than will be produced by using the No. 6

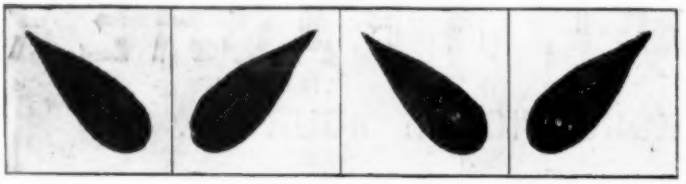


FIG. 3.

brush (recommended later on), but of course they retain the same relative positions. The petals of the flower (Fig. 9) may be taken as about the normal size.

The position shown in Fig. 1 is perhaps the most natural way to lay the brush at the commencement. Notice that it comes exactly in the centre of the square and coincides with the diagonal. This carefulness in placing the blob in a definite position should be insisted on from the first, for with all its apparent freedom, brush drawing really demands precise work.

The impressions are in turn practised in all directions, such as seen in the 'flower' in Fig. 9. The paper may be moved when necessary; the regulation in force with regard to this in connection with the ordinary drawing does not apply to brushwork. Take the petals of the flower in Fig. 9 as an example. Calling the upper vertical one A, and going round in the usual way, then A, B, C, D, and E could be done with the paper in its normal position; for F, however, which is exactly like that shown in Fig. 2 for position, the paper would have to be turned, so that this petal may be placed in its proper position, without there being any undue strain on the hand. Similarly with G and H, and with many other instances in

FIG. 5.

the other examples. Of course the paper should only be turned when necessary. We do not wish to reduce the hand to the level of a machine, able only to produce just one stroke in one position, but on the other hand we should not create a difficulty for the sake of avoiding turning the paper a little this way or that.

The next stage is to join two impressions together, as seen in Figs. 4, 5, 6, and 7, and this gives the simple ovate type of leaf. Examples would, of course, be practised separately before being utilised for simple design.

This mastered, the children are taught to draw a short straight or curved line with the point of the brush, as we cannot do much in the way of design, or in the representation of natural forms, without using a line. It is not a very easy operation to draw a line with a brush, but by keeping the lines short and having the help of the squared paper, I think it will soon be accomplished.

Now, with the elements they have learnt—viz., the brush impression, the dot (which is really a brush impression obtained by holding the brush upright), the straight and curved line—any number of arrangements to form borders, to represent simple types of living forms or floral forms, or to fill spaces, may readily be obtained. I have only, in the present illustrations, just touched the fringe of the first two. Figs. 4, 5, 6, and 7 are arrangements of these elements to form border patterns, but of course these examples must not be taken to represent a graduated scheme; they go by too rapid steps from simple to difficult examples, and many exercises would be needed to fill up the gap between Figs. 5 and 6, and between Figs. 6 and 7. Similarly the two gnat forms are given merely as instances of the use to which the elements may be put.

It is here that the truly educational part of the work may be carried on. With squared paper to work on, so as to secure reasonable precision and regularity in the work, and with these examples and others as types, the children can be encouraged to make arrangements for themselves, so that the educational process of 'drawing out' the child's own ideas and impressions will be followed. You will soon discover that children are not destitute of ideas, but that the

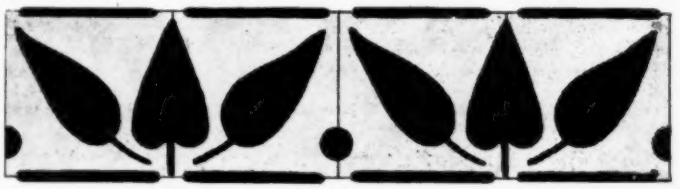


FIG. 4.

ideas run riot, and want marshalling into some sort of order. The brush is by far the readiest and most suitable means of conveying these impressions to paper.

Lest it should be thought that I am making too exclusive use of squared paper, it may be well to state that in the full course, plain paper and squared paper are used concurrently from the first.

Fig. 9 utilises not only the brush impression, but also introduces drawing with the brush—the typical brush strokes. As will be seen when I come to deal in detail with the various shapes, there are several steps leading on from the brush impression to this kind of work.

The crux of the whole scheme of brushwork is accurate observation, and as the Departmental Circular (which everyone should read) points out, 'if their observation has been inexact, the error becomes obvious when they try to draw their impression.'

The materials necessary to carry on the work are few and comparatively inexpensive. Ordinary drawing paper, squared as before mentioned, serves very well, and the consumption would be about the same probably as for the ordinary drawing. The paper should not have a glazed surface.

For the brush, a No. 6 Siberian hair in nickel will be found a

FIG. 6.

most convenient size. This will cost about fourpence, or rather less by quantities, and with reasonable care should last some years.

The colour may be had in various ways, but it will probably

BRITISH MUSEUM

be found most economical, both for cost and time, to have what are technically known as double 4 in. tubes, filled with

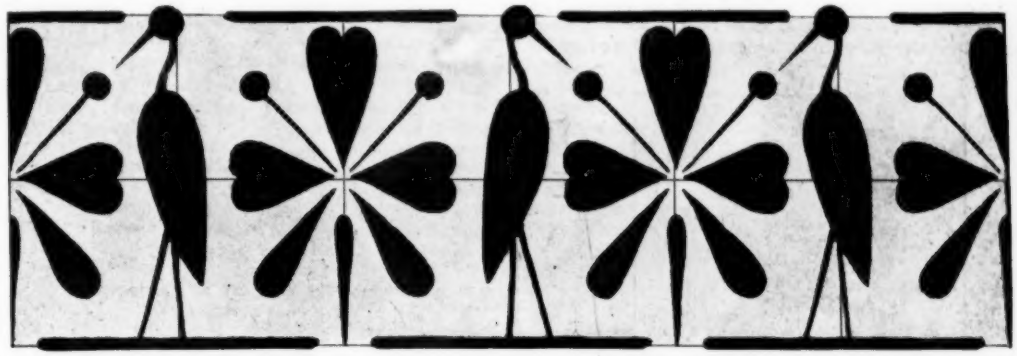


Fig. 7.

the second quality of colour, which is quite good enough. Each tube will cost ninepence or tenpence, but three or four such would last a class of sixty children for a year. The best plan is then to spread the palettes out on a table (thirty for sixty children), and squeeze a little colour out of the tube into each palette. Half the size of a pea will be quite enough for two children. Add to this a single spot of water, as the colour for this work needs to be of a creamy substance. The whole of this could be done in three or four minutes; it is much quicker and better than giving out a separate colour to each child.

For palettes the 2 in. or 2½ in. 'round paints' are very suitable and durable. They cost just over a halfpenny each.

Taking one year with another, the work could be carried on at about threepence per head, including the provision of copies, but exclusive of drawing paper, which would be a variable quantity.

Fig. 8.

Of the educational value of handwork of the various kinds, I do not think there can be any doubt. Enlightened educators, like the Rev. T. W. Sharpe, Dr. Fitch, and many others, all advocate its introduction wherever possible. Mr. Rooper, H.M.I., who has taken great interest in the subject, says—'Handwork is the only instruction in which you can make certain that the learner is not trusting to words, and words only.' The unparalleled success of the Kindergarten principle in infant schools is now well-nigh beyond the range of criticism, and manual occupation enters largely into it. Now, the child does not lose that innate love of construction when he leaves the infant school. He will take just as great a delight in folding and cutting coloured paper, in colouring, in modelling, in brush drawing, when he enters the senior schools, if only these subjects are made to run parallel to his increased mental capacity. I say mental capacity, because so often the mental training is altogether overlooked in speaking of manual work. I know great uncertainty exists in the mind of many teachers as to the value of manual work as an educational factor, and it has many adverse critics. All sorts of hypothetical difficulties are created; it is very expensive, too much trouble, not necessary, and many other objections which have no foundation in fact. It may safely be said that of those teachers who have tried it with an open mind, the vast majority pronounce in its favour; as for the scholars, only once, in all my experience, have I heard it said, 'The children didn't care for it.' The verdict nearly always is, 'The children like it so.' I think the immense popularity of manual work with the children alone should ensure its success. As I have said, the value of manual exercises in the Kindergarten is established, and, for boys at least, the success of the wood-

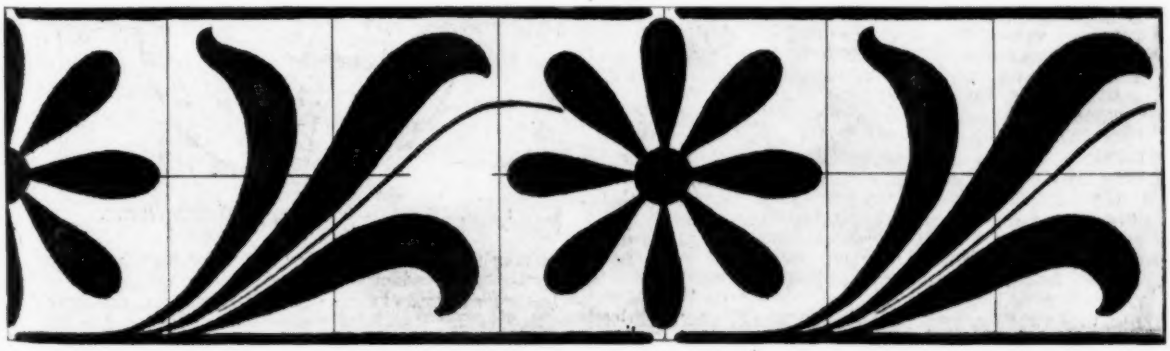


Fig. 9.

work is now generally acknowledged. Can we therefore logically leave out all forms of manual work during the period which elapses between the two?

The *Schoolmaster* of Oct. 3rd published some account of the Belgian Teachers Conference at Liége.

Mr. Wild notes that one point to be discussed was, 'Is it desirable to modify the existing programme of primary instruction so as to develop those branches which some persons consider as specially useful to workmen, or should we leave it

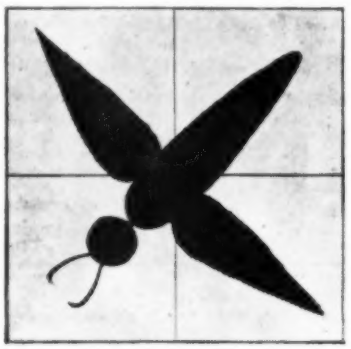


FIG. 10.

as it is, and seek to complete it by supplementary professional instruction?' It was decided that it was desirable to modify it, but under what exact conditions was left for future consideration.

In France, manual occupations have long since formed an integral part of the elementary school work; in America, it is nearly universal, and I have no doubt that in the near future the value of such work will be well recognised in England.

CLASS LESSONS IN DOMESTIC ECONOMY.

BY ETHEL R. LUSH.

Author of 'Chats with Children on Domestic Economy,' Head Mistress of the Ipswich Higher Grade Girls' School, and Organising Mistress to the Ipswich School Board.

STANDARD III.

Lesson V.

COTTON, LINEN, AND INDIA-RUBBER.

[*Apparatus.*—Pictures of cotton plant and cotton field. Microscope, and slide of cotton fibres. Case showing cotton in various stages of manufacture. (This may be obtained from Horrocks, Miller & Co.). Slide of linen fibres. Flax plant in pot. Specimens of linen materials. Pieces of waterproof cloth.]

Hitherto our lessons have been on clothing materials derived from the animal kingdom; we shall now deal with materials belonging to the vegetable kingdom. Of these, cotton and linen are the most important.

If you look at a picture of the cotton plant, you will see that it has large yellow flowers and bright green leaves, while here and there are patches of fluffy white down escaping from dry seed-pods about the size of a walnut. This down is the raw cotton. As the flowers die off, seed-pods take their place and gradually grow larger and larger until, when they are quite ripe, they burst open and the woolly down is seen hanging from them.

Cotton will thrive only in hot countries, such as Egypt, India, Brazil, and the Southern States of N. America. In these countries whole fields are planted with cotton in the spring, and in the summer the pods open and burst, giving to the plantations the appearance of being covered with large flakes of snow.

Then the cotton harvest takes place; men, women, and children, usually negroes, go up and down between the long lines of cotton plants collecting the raw cotton in baskets,

PORTION OF THE COTTON PLANT, SHOWING LEAVES, FLOWERS, AND PODS.

which they carry slung from their necks. If you examine a handful of raw cotton you will find that it is of a yellowish-white colour, is very soft and yielding to the touch, and indeed is not unlike the cotton-wool with which you are all familiar. By pulling a small flake to pieces we find that cotton, like wool and silk, is made up of fibres, and on examining the structure of these under the microscope we see that they are flat and twisted, thus differing very considerably from wool and silk fibres.

When the cotton-picking is over, and the cotton has been dried in the sun, it is packed into large bales and great quan-

SLIDE SHOWING MAGNIFIED COTTON-FIBRES.

tities are shipped to Liverpool, *en route* for Manchester and other Lancashire cotton towns.

In the large mills of these manufacturing towns, raw cotton undergoes many transforming processes. If we were to take a piece of cotton from a bale it would be found to be full of black seeds and matted together with various kinds of dirt; the first thing to do, therefore, is to cleanse it, and with this object it is passed through a machine called a 'blower.'

The cotton then goes through various carding and spinning processes until it is formed into thread strong enough to be woven in looms into the several materials. Of these, calico,

muslin, print, cretonne, flannelette, sheeting, towelling, fustian, jean, velveteen, and corduroy are the chief.

In view of this imposing list you will readily credit the fact that cotton forms the clothing of a larger proportion of the human race than any other material.

Calico is sold both unbleached and bleached. In the former the natural colour of the raw material remains; in the latter it has been removed by the action of chemicals. Bleached calico is more expensive than unbleached, and looks better; but the latter, though cheaper, is considered to be more durable, and after frequent washing becomes almost as white as the bleached. Calico is used very largely for men's shirts, women's and children's underclothing, sheets, pillow-cases, and other things which require frequent washing.

Muslin can be bought in great variety, from butter muslin and 'art' muslin at 2d. a yard to the fine muslin used for blouses and sold at 2s. a yard.

Prints are made in delicate colours and stamped with dainty designs; *ginghams* and *zephyrs* are woven from dyed yarns. They are used for dresses, pinafores, blouses, and underskirts. *Turkey-red* is a very durable cotton material, which takes its name from its peculiar colour, due to a fast dye. It is used for pinafores, children's dresses, etc.

Flannelette is becoming increasingly popular as a material for underclothing and nightdresses. It is thicker, softer, and warmer than calico, and is made in very pleasing colours. Cheap flannelettes do not wear well, but the stouter varieties are extremely durable. Flannelette has to some extent taken the place of flannel, but this is inadvisable, for reasons we shall presently see.

Fustian, jean, and *velveteen* are used for making outer garments, and are very durable. *Corduroy* is a strong cotton fabric which is woven in ridges, and forms perhaps the most durable material known for men's trousers and boys' suits.

Other articles made from cotton are *sewing cottons* and *thread* from which *lace* goods are manufactured. You will remember from former lessons that cotton is a good conductor of heat, and that it quickly becomes saturated with moisture. For these reasons it is inadvisable to wear cotton materials next the skin, even in the warmest weather. Notwithstanding this, however, cotton goods are very useful materials of clothing. They are durable, cheap enough to be within the reach of the poorest, very easily washed, do not shrink, and when clean look almost as fresh and pretty as if quite new.

FLAX PLANT.

Let us turn our attention for a short time to *linen*. By looking at a picture of the flax plant, from which linen is made, or better still by looking at an actual flax plant, we find that the stems are thin, the leaves narrow and pointed, and the tiny flowers of a pretty bright blue.

If you would like to watch the growth of a flax plant, you may do so by planting a little linseed in a flower-pot.

When the flowers of the plant die and fall off, their place is taken by seed-pods, and these are found to be full of tiny brown seeds which we all know as linseed. Flax is grown principally in Ireland and Russia. The plant grows to a height of two or three feet, and when the flowers and leaves have fallen off it is time to gather it in.

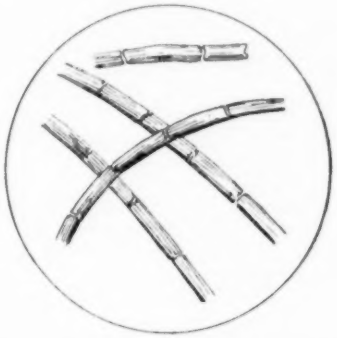
The long yellow stalks with their bunches of seed-pods at the top are carefully uprooted one by one by men, women, and children, gathered into bundles, and laid out in order to dry in the sun. The seed-pods are next separated from the stalks by a simple process known as 'rippling,' which is done in this way:—The ripplers—men engaged in the work—sit before a large iron comb with its teeth turned upwards—the rippler—and draw handfuls of flax through the teeth, thus removing the seeds, which fall into a sheet placed underneath. The stems are next steeped in shallow pools of water for ten or twelve days. This rots away the softer parts of the stem, and at the same time makes the harder woody parts very brittle and easily removed. The useless parts are taken away by pounding the stalks with mallets, and the tougher fibres of the stem are left intact.

This process is termed 'retting.' You will, perhaps, understand it better by looking at the stems of flax before you; these have been steeping twelve days; after carefully wiping away the soft pulpy portions with a cloth we find very little besides long tough fibres remains to us. These are next passed through a series of combs, each comb being finer than the one before, and by this means the short fibres are separated from the long ones. After cleaning and bleaching, the flax is packed into bales and sent to the manufacturer to be spun and woven, much in the same way as cotton is. Only the long fine fibres are used for linen, the coarse ones form tow from which rope and string are made.

Linen is put to many uses. It is invariably used for collars and cuffs, its smooth, glossy nature, combined with its durability, rendering it peculiarly suitable for such purposes. Sheets, pillow-cases, table-cloths, serviettes, tray-cloths, glass-cloths, towels, handkerchiefs, window-blinds, are all made of linen of varying degrees of fineness. We will compare the fine linen used for handkerchiefs with the slightly coarser variety used for bed-linen, and this again with the still coarser huckaback used for towels.

The linen used for tablecloths is woven in a pattern, and is known as *damask*, taking its name from the city of Damascus in Syria, where the 'fine linen' spoken of in the Bible used to be manufactured.

Holland is another well-known linen material which is extensively used for dresses, pinafores, and aprons.



LINEN-FIBRES AS SEEN UNDER THE MICROSCOPE.

Cambric and *lawn* are very fine varieties of linen used for handkerchiefs, surplices, dresses, pinafores, etc.

Many varieties of *linen thread* are manufactured. Some kinds are used for making the better kinds of lace.

We have seen that much of the popularity of linen is owing to the high finish it is capable of taking. A glance at the nature of the fibres will show us why linen has this gloss. Looking at the fibres under the microscope we find that, like those of silk, they are round and smooth ; they differ from silk fibres, however, in being jointed and fibrous in structure.

You will have already gathered that linen is an extremely suitable material for sheets, pillow-cases, towels, and other articles which should last a long time ; also for collars, cuffs, shirt-fronts, tablecloths, etc., which should present a good appearance. When we begin to enquire into some other of its properties, however, we find that there are well-defined limits to its usefulness. If we touch a piece of flannel and then immediately afterwards a piece of linen, we are struck by the fact that the linen feels cold. That it is not really colder than flannel is easily proved by wrapping a thermometer first in flannel and subsequently in linen. In neither case will the thermometer vary from its original temperature. The explanation of the coldness of linen is due to its power of conduction. It is such a good conductor of heat that, as soon as the hand touches it, heat passes from the skin through the linen and we feel cold. This fact alone is sufficient to demonstrate to us its unsuitability for wear next to the skin ; but an additional reason is provided by the fact that linen rapidly becomes saturated with moisture, hence if linen form our underwear, perspiration cannot escape and a chill to the body results.

India-rubber and *guttapercha* are two other vegetable materials which are extensively used in clothing. They are non-porous materials, as you can see for yourselves by filling an india-rubber ball or syringe with water, and are used in the manufacture of waterproofs, goloshes, overshoes, bathing caps, etc. It will be difficult for you to realise that the lump of india-rubber you use in your drawing lesson is the same material which renders your mackintosh non-porous. India-rubber is the juice of an enormous tree which grows in Central and South America, also in the East Indies. Holes are cut in the trunk of the india-rubber tree at the proper season, and as the juice flows slowly out—a thick yellowish fluid—it is caught in tin cups, which are presently emptied into pails. It is next dried in the sun, and subsequently goes through many processes before it is fit for use. India-rubber which is used in making waterproof coats and cloaks is dissolved in naphtha and then spread upon cloth, much in the same way as treacle is spread on a piece of bread. The naphtha quickly evaporates, and the thin layer of india-rubber remains. The drawback to the use of waterproof clothing is that owing to its being non-porous the perspiration cannot escape from the body, and chills are thus produced.

Summary.

Cotton is the soft down contained in the pod of the cotton plant. It is grown in Egypt, Brazil, and the Southern States of North America.

A cotton fibre is flat and twisted, and from $\frac{1}{800}$ to $\frac{1}{2000}$ of an inch in width.

Cotton is manufactured in Manchester, Wigan, Bolton, and other Lancashire towns. It is first cleansed and then spun and woven into cloth.

Cotton goods include calico, muslin, prints, ginghams, zephyrs, cretonne, Turkey-red, flannelette, sheeting, towelling, fustian, jean, corduroy, and velveteen.

Linen is manufactured from the fibrous stem of the flax plant which is grown in Russia and Ireland. The seeds are separated from the stem by 'rippling.' The fibres are separated from the useless parts of the stem by 'retting' and subsequent pounding with a mallet.

Linen is used for collars, fronts, cuffs, table-linen, bed-linen, etc.

Linen goods include damask, holland, cambric, lawn, sheeting, towelling, etc.

Linen fibres are smooth, round, and glossy.

Properties of linen.—It is a good conductor of heat, quickly becomes saturated with moisture, is durable, and is capable of taking a high finish.

India-rubber is used in making waterproof materials.

MODERN EDUCATIONAL REFORMERS.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

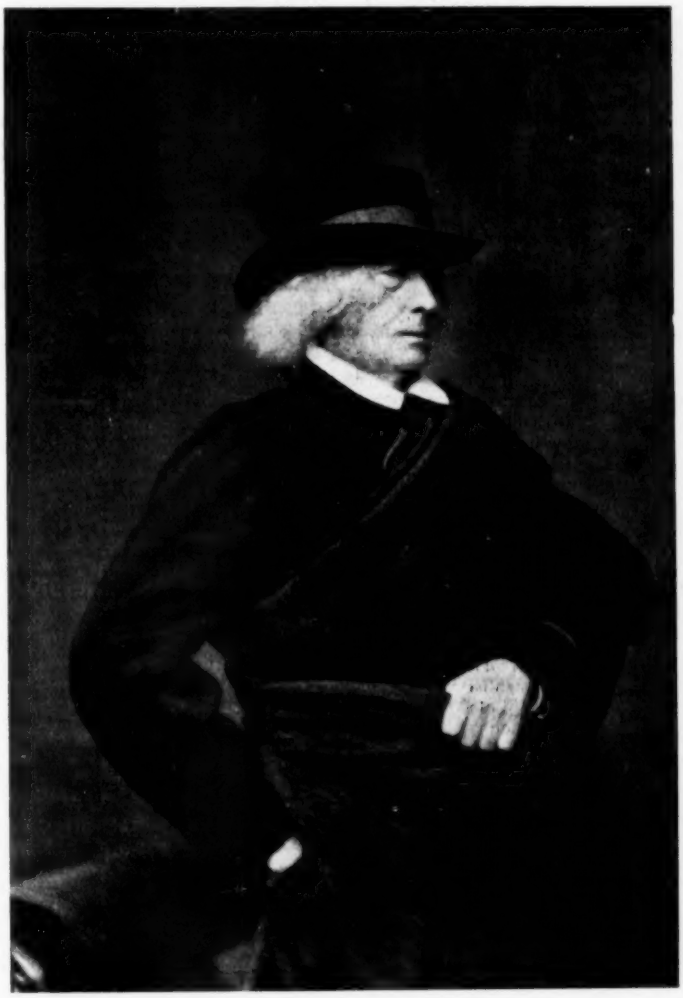
Author of 'Mental Science and Logic for Teachers.' Late Director of the Birkbeck Training Classes and Lecturer therein on School Method.

XXV.—JOHN STUART BLACKIE.

The apotheosis of the schoolmaster, so far especially as concerns the British Isles, is deep in the womb of the future. Both the greater and the lesser fry of the teaching profession have, perforce, to rest content with the veriest pittance in the way of national recognition. When, therefore, we hap upon a professor whose name is a household word from John o' Groat's to Land's End, it goes without the saying that his endowment must have been uncommonly great, just as his achievement is exceptionally unique. That such was indeed the case with respect to John Stuart Blackie few, if any, will be found to dispute. When, on March 4th, 1895, Blackie was gathered to his fathers, universal opinion declared the country the poorer by the loss of a gifted son, and by no section of the community was this loss more severely felt or more sincerely mourned than by the knights of the chalk and duster. And with good reason, seeing how few are the men, from remotest ages even down to modern times, who have done so much to make the name of pedagogue blessed in this land of inability to place in just proportion the value of the teacher.

The life of Blackie has more than a tincture of romance in it. He was the son of an Aberdeen banker, although born in Glasgow on July 28th, 1809. Until the age of twelve he was educated at Merson's Academy, Aberdeen. He was then transferred to Marischal College, one of the two constituent colleges of Aberdeen University, where he remained for three years, and was then placed in a lawyer's office in the same town, it having been decided that he should follow the law as a profession. A very short experience of the drudgery of a lawyer's office soon convinced the youth that he had no vocation in that direction, and accordingly we find his father removing him to Edinburgh, there to qualify for the ministry. It was not long after this that the young student, like so many more thoughtful, earnest souls, was plunged into the abyss of religious depression, which became so pronounced as to make the lad's life a burden to himself and a source of perennial anxiety to his friends. Acting upon the advice of Dr. Forbes, Mr. Blackie resolved to send his son to Germany in order to break him of his morbid habits of mind, and in April 1829 he set out, accompanied by two of Dr. Forbes' sons, for Göttingen, at which university, in conjunction with that of Berlin (whither he migrated on account of impaired health after about a year spent in Göttingen), he received what was truly his education—an education the effect of which was apparent to the day of his death, so that the epithet 'German Blackie,' applied to him upon his return, was by no means inappropriate or undeserved. It is the fashion to regard things 'made in Germany' as 'billig und schlecht,' a most pernicious fashion, devised, as Carlyle would say, by the devil to

blind our eyes to our shortcomings, and to deaden our efforts towards excellence. There is no denying the fact that Professor Blackie was 'made in Germany,' and it is equally certain that he was well and truly made, for he lost all his narrowness and gained a conception of the whole duty of a teacher which egged him on persistently in after years to use both pen and voice in his attempts to make university teaching in Britain more of a reality than it, at that time, was. Scarce two months at Göttingen was sufficient to open the young Scot's eyes to the imperfections of home universities, and an indignant letter was written home, which duly appeared in the pages of the Summer Number of the *Edinburgh Literary Journal*. This was the beginning of the attempts above referred to, which never were relaxed during his long life, but found ready expression on every convenient occasion. Here are the 'ipsissima verba' of the Reformer as written to his father:—'With reference to our Scottish system of education, the scales fell from my eyes. I perceived that at Marischal College they had degraded the University pretty much into a school; that they drilled boys when they ought to have been stimulating young men; that our academical system was pre-eminently puerile, and our standard of attainment lamentably low. I burned with indignation when I thought of these things, and from that moment became a University Reformer.' This was playing the candid friend with a vengeance, but it was strictly in accord with Blackie's practice; indeed, he quaintly, in later years, proclaimed this to all and sundry of his correspondents, by writing, as a declaration and as a stimulus, on the envelopes of the letters he sent out, 'Αληθεύων ἐν ἀγάπῃ' (Speaking—and acting—the truth in love.)



JOHN STUART BLACKIE.

From 1830 to 1831, the young and willing outlaw lived at Rome and in various parts of Italy, drinking in classical lore, learning Italian and drawing, and improving his mind by communion with men of light and leading, mostly Germans, whose acquaintance he made in the Eternal City. Of these the most important was Herr Bunsen, the Prussian Ambassador to the Papal Court, for whom Blackie ever preserved the most lively feelings of regard, as indeed he did for several of the German professors at Göttingen and Berlin.

By this time it had been borne in upon the mind of the young student that he could not enter the ministry because of the revulsion from Calvinism that had become part of his nature. It, therefore, once again became incumbent upon him to choose a profession. Knowing how earnestly he admired the German professors, remembering how well he enjoyed a studious life, and bearing also in mind his determination to reform Scottish procedure in Education, it will not be surprising that he set before him as most worthy of striving after, the Professor's Chair. Henceforth he devoted himself assiduously to Greek as being the subject which he determined to profess. Fain would John have spent the succeeding winter at Bonn; but he had been absent for 2½ years, and a peremptory letter from his father summoned him home. Home then he hied himself, and was met in London by his father, who, during a short round of mild junketing, introduced his son to several eminent men. Arrived in Edinburgh, the question arose as to what should be the profession of the returned one, until a Chair became possible, and once again the law was agreed upon, only, as the sequel will prove, to be again rejected as uncongenial and impossible. His father, with a liberality beyond his means, agreed to allow his son an income of £100 per annum for three years,

during which the necessary examinations were to be passed. Passed indeed thay were, but as only two briefs were obtained in five succeeding years, it was sufficiently apparent that the young lawyer was more likely to die by the law than to keep himself alive thereby. But he had not abandoned the resolve formed in Rome, and during his three years' preparation for the law, much of his time had been devoted to the study of Greek. He had also begun to use his pen in contributing articles to the magazines. Upon the proceeds of this work he had to subsist, as the parental subvention was withdrawn at the end of the stated three years, and our reformer was too high-spirited to ask for, or even to desire, further financial help from a parent who had done so much for him already. With respect to the nature of this journalistic work, all that need be said here is that it consisted mainly in attempts to acquaint his countrymen with that excellence in German literature and in German education in which he so profoundly believed. One of his earliest attempts was the translation of Goethe's 'Faust,' a work that won for him the approval of Thomas Carlyle, with whom Blackie was henceforth on terms of closest intimacy.

Not only were attempts made to win success in prose; poetry also, and that too of a high order, flowed from the ready pen of the literary aspirant, who, however, had trouble to join the two ends, so that he was regarded by his friends as next door to that graceless individual, a ne'er-do-well. In 1839, however, the outlook suddenly took on a cheering aspect. At Aberdeen University a Chair of Latin, or Humanity as it was called, was founded at Marischal College, and, aided by the many devoted friends who had been attracted by his genius, John Stuart Blackie became the first Professor.

Meanwhile other events of a more personal nature had been transpiring, to which we must for the moment turn. 'A man,' Chaucer tells us, 'must needès love, maugré his head.' Whether this be so universal as the immortal Geoffrey asserts, we need not stop to inquire. It was true in the case of Blackie. He was accepted by his cousin Eliza Wyld, but unhesitatingly rejected by her father, who took extreme measures to prevent his daughter from having any intercourse with so shady an individual as Blackie was pictured to the parental and prudential mind. Miss Wyld soon showed herself to be possessed of sufficient strength of love to resist coercion, and of sufficient resolution to accomplish the desire of her heart. She absconded from her father's house and went to reside with a relative at Edinburgh, declaring firmly that it would be impossible to return to the parental roof whilst the embargo on her intercourse with the budding Professor remained in force. In the meantime Blackie had received his appointment as Professor of Humanity at Aberdeen. He was not destined to peacefuliy enter upon the duties of his office, for the simple reason that he could not conscientiously subscribe to the Westminster Confession, and without an attested signature to these articles of Calvinistic faith the appointment could not be ratified. Matters were likely to be at a deadlock, as already some feeling was aroused in antagonism to the Professor-elect, when finally he resolved to sign under protest as it were, by accompanying his signature with the declaration that he signed as a layman who was not 'sufficiently learned in theology to be able to decide on many articles of the Confession of Faith.' This conditional confession roused the ire of the Church authorities, and much opposition, culminating in a lawsuit, ensued, only, however, to terminate in the triumph of the young Professor, who at length took possession of the professorial chair. Shortly afterwards he also took possession of Miss Wyld, the parental embargo upon the match having at length been withdrawn. Many petty worries still remained to be surmounted before Professor Blackie was permitted to pursue his way in peace and contentment as High Priest of Aberdonian Latinity. *His* way most emphatically it was, and just as certainly it was a good way.

Like Herbert Spencer, Blackie believed that education should prepare for complete living; hence, on the one hand, he deprecated the lack of proper preparation in the lower schools, which precipitated into the university raw youths who were utterly unable to benefit by the teaching. On the other hand, he 'reprobated the exclusion from the great centres of learning of all such subjects as could help to make men more capable of the practical work to which they were called at the close of their student days. Alike in the English and the Scotch universities, modern languages, historical research, and the sciences were either condemned to a position inferior to the Latin and Greek languages, or wholly ignored, while these languages were pedantically taught, and inspired few to use the treasures of history, poetry, and philosophy to which they gave admission.' By pamphlets, by magazine articles, by letters to the public press, the Professor incessantly cried out for rationalism in education, and great were the changes for good due, either directly or indirectly, to this laudable championship of educational reform. The words just quoted aptly describe the peculiar feature of Blackie's teaching. His chief aim was to inspire. To give his pupils such a love of learning as would impel them to self-study, was for him a much more congenial occupation than a mere disquisition on the niceties of unimportant grammatical curiosities.

Above all he was animated with the desire to be more than a mere expositor. He studied his pupils, and incessantly strove to fashion their characters whilst filling their minds with learning. This explains the strong hold that he had upon his students, who never seemed to forget him, and who rejoiced to narrate how he had been as a lantern to their feet, not merely in learning but also in living. It was not long before the Professor met with outside support; support from within, however, was much slower in showing itself.

During this time Professor Blackie was engaged in perfecting his Greek, and especially in the production of a metrical translation of Æschylus. This he took twelve years to accomplish, and when at length he published the translation, he and his wife had to give up their house and take to lodging in two rooms in order to save the funds necessary for the publication, which took place in 1850. The Professor wished to exchange brass for gold, which was his way of expressing the superiority of Greek over Latin, and when the Greek Professorship at Edinburgh became vacant, at the end of 1851, he at once set about his candidature; but so eccentric was he both in dress and in manner that the position was only won by his friends

in spite of him, and then only by the casting vote of the Chairman. For 30 years Professor Blackie remained at the post of Greek Professor at Edinburgh, never tiring as champion of the forward policy in education, never losing faith in the ultimate success of his efforts. Of the many movements that he took in hand in addition to education reform, of his wanderings in his own and in foreign lands, of his lectures, of his meetings with famous men of all conditions and sorts, of the house that he built at Oban, and of the open-handed charity he dispensed there as at Edinburgh, space will permit but a bare mention. He was a man who thought best on his feet, and the 'spirit of the feet' impelled him to infinite mountain climbing, which alone seemed able to ward off the attacks of chronic head and chest complaints.

Space must be found for an incident that cannot but interest the primary teacher, as the scene is laid in a Skye primary school. 'About 130 comely young persons of both sexes screamed out with harsh voice some of the well-known English and Scotch songs generally sung in Lowland schools. Not being particularly edified with this exhibition, I asked for a Gaelic song, but, as I expected, could get none, so little do the red-tape gentlemen upstairs know of the first principles of moral education, one of which is to cultivate the heart by the agency of the mother tongue and of popular song—the growth of the soil. The spirit immediately moved me to stand up and exhort the master and the scholars to the cultivation of native song; and, to nail down my exhortation, I took a pound note out of my purse and, wrapping a shilling in it, proclaimed a guinea prize for the best Gaelic song to be sung at the next examination.'

This love of Gaelic was aroused in him by a chance acquaintance with the likeness between *equus* and *each*, the Latin and Gaelic words for horse, and gradually, the conviction forced itself upon him that Gaelic, like Greek, must not be allowed to number itself amongst the dead languages. He accordingly took upon himself the arduous labour of collecting sufficient funds to endow a Celtic chair at Edinburgh, which herculean task eventually he accomplished, having by lecturing, by soliciting subscriptions, and by every other means available, got together upwards of £12,000—an accomplishment sufficient in itself to number the 'Apostle of the Celts' amongst the heroes of educational struggle.

Of his many works we will mention but one, viz., 'Self-Culture,' wherein he exhorts to a noble life in most eloquent words, the text of which is the following: 'Having by the golden gift of God, the glorious lot of living, let us endeavour to live nobly.'

Quick tells us that of works on education emanating from English authors but three, viz., those of Ascham, Locke, and Herbert Spencer, have attained international honours, as evidenced by their translation into divers foreign tongues. To this list of three Blackie's 'Self Culture' makes a worthy fourth, having been translated into Greek, French, German, Italian, Danish, Swedish, Finnish, and Hindostani.

In 1882 the Professor resigned the Greek Chair, from which he had taught not only how to appreciate Greek, but also how to live. From all parts of the earth came regrets and appreciations tending to make the step less painful, but nothing could completely take away the sting of separation, albeit the buoyant disposition of the veteran reformer soon reconciled him to the inevitable.

In ceaseless activity for the next ten years Professor Blackie pursued the reformer's path, never neglecting an opportunity to advance that cause of education whose claims had laid violent hold of him in the little Göttingen University, and when the end came in the spring of 1895 it found the aged Reformer ready to enter upon the rest that he had so doughtily won.

To Miss Anna Stoddart, the able biographer of the grand old Scot, all admirers of Blackie must feel deeply indebted. The writer wishes to acknowledge the great help he has received from her Life in sketching the foregoing inadequate yet withal sincere appreciation of this veritable Wizard of the North.

OUR PUPIL TEACHERS' AND SCHOLARSHIP COURSE.

BY ARTHUR T. FLUX,

Head Master of the Belvedere Pupil Teachers' Centre, First on Scholarship List, Author of 'Scholarship School Management.'

PUPIL TEACHERS' COURSE.

1. For April 1897.—Seventh Month.

Work to be Prepared.

A.—*English.*

(Students are invited to write for assistance in cases of doubt or difficulty.)

First Year.

1. The Verb: Participles and the Gerund. These must be carefully learnt.
2. Revise Anglo-Saxon suffixes. Tabulate the suffixes in the first half of the 'Elegy.'
3. Prepare verses 25–28 of Gray's 'Elegy in a Country Churchyard.' Learn the meanings of all allusions, references, and the derivations of the chief words. Use Macmillan's edition.

Second Year.

1. The Adverb and its functions. Prepare a good classification; note degrees of comparison.
2. Anglo-Saxon Verb prefixes, with examples.
3. Prepare lines 243–276 of the 'Winter Evening' (*Task*, Book IV.). Make sure of meanings, learn all notes, explanations of allusions, and derivations of chief words. Pay special attention to the paraphrasing.

Third Year.

1. Greek prefixes and affixes.
2. Study the figures of speech.
3. *Julius Cæsar.*—Prepare Act IV., Scenes 1, 2, and 3 (up to the entrance of the Poet). Note particularly Antony's description of Lepidus, and the quarrel between Brutus and Cassius.

Notes:—

1. Paraphrase of the 'Elegy.'

The tolling of the curfew intimates the fast approach of night. The landscape glimmers faintly under the light of the setting sun, and as the herd of lowing cows pass over the meadow, and the ploughman plods wearily to his home, a stillness falls over the earth, broken only by the droning flight of some beetle, the faint tinkle of the sheep-bells in the distant fields, or the hoot of the owl, which, disturbed by my presence, flits from the old ivy-covered church tower and seems to protest against my invasion of what has long been her own particular domain.

Lying quietly in their last resting places, the places being marked by the grass-covered mounds, the simple ancestors of the village population sleep under the shade of the old elms and yews, oblivious to all the stir and bustle of life. No longer is the sweet scented air of the early morning, or the twitter of the swallow, the crowing of the cock, or the sound of the huntsman's horn, a signal to them to commence once again

their daily round of simple duties. No more returning at evening are they welcomed by the bright fireside, the loving attentions of a wife, or the eager and tumultuous joy of prattling children. Their days were spent in the arduous employments of the country, in wielding the sickle in the golden corn or in breaking the turf in some meadow, in cheerfully driving the heavily laden waggons or felling the sturdy trees.

Yet though their lives were thus passed in simple pursuits, and they were unknown to fame and ignorant of the greater world beyond them, this is no reason why they should be despised, or why the annals of their lives should be superciliously received by those of a higher station. After all, the grave is the common end of mankind, and neither the claims of long descent, nor the possession of personal beauty and wealth, nor even the glory and fame earned by great deeds, can enable the possessor to escape the narrow vault in which all are alike.

Nor is it their fault if their names are not preserved by costly tombs and glowing inscriptions, or their obsequies conducted with the magnificent pageantry and rolling music which is the lot of some.

Can any care or honour restore life to the cold clay? What effect has the noble tomb, the lifelike figure, the unanimous praise or flattery of all, when once life has departed?

(*To be continued.*)

2. General paraphrase of the 'Winter Evening.'

Over the long bridge which crosses the broad wintry stream, just now reflecting the new moon, comes the postboy with his resounding horn. With his hair powdered with sleet, his broad strapped waist, and his mud be-spattered boots, he breaks into our solitude as the messenger from the noisy outside world. His bag contains a budget of news from all parts of the earth; but this affects neither him nor his horse, his one object is speed, and having reached the village inn, his destination, he hurries onward. Heedless of what he brings, he whistles cheerfully through the cold evening; yet, doubtless, his letters have brought tidings of sorrow to many a one and joyful news to others. It may be the news of some great conflagration, or of the decline in price of stocks, or of births, marriages, and deaths; it is all one to him. Some of the letters he brings are spotted with tears which flowed as freely as the ink from the pen; some contain the protestations of love from absent lovers, or the answering vows of their sweethearts.

Who can predict the news brought with such careless noise? Is the tide of affairs in America improved, or do our troops still act as though they were drugged with opium? Has India been freed from her cruel despotic rulers, and does she smile in peace and plenty, or is she still ground down and desolate?

One cannot repress the natural anxiety to set free the all-important news brought, and in imagination to follow the great debate, the popular speech, the witty reply, and all the reasoning and arguments which entertain the world.

So let us stir up the fire, close the shutters, draw the curtains, wheel the sofa into a comfortable position, and, while the fragrant odour arises from the tea which is being prepared—a beverage which exhilarates but does not intoxicate—let us settle down to a quiet and enjoyable evening.

(*To be continued.*)

B.—*Arithmetic.*

First Year.

Boys.—Lock. Miscellaneous Exercises, LIX.

Girls.—Dixon and Beach. Example XXXVA., Miscellaneous, Nos. 1–30.

Second Year.

Boys.—Lock. Example CXXX., Nos. 1–20.

Girls.—Dixon and Beach. Chapters XX. and XXI., and all Examples.

Third Year.

Boys.—Lock. Work Examples for Exercise Nos. 951–975, pp. 285 and 286.

Girls.—Dixon and Beach. Read Chapter XXVII. and work Examples.

(The greatest care must be paid to style and neatness. Sufficient explanation must be added to each sum to make the reason for each step quite clear.)

C.—*Music.*

First Year.—Practise any questions.

Second Year.—Continue practise in modulation.

Third Year.—Finish the musical terms in common use.

D.—*Spelling.*

Learn 50 words per week from 'Words Commonly Misspelt,' or any good list, and test by dictation.

E.—*Geography.*

Mexico and Central America.

Chief points:—

Mexico.—A Federal Republic, comprising 27 states, two territories, and the district of Mexico. Area 750,000 sq. miles, and a population of 10,500,000. Volcanic in character.

Chief ports:—Vera Cruz, Progreso, and Tampico on the Gulf of Mexico, and Mazatlan and Guaymas on the Pacific.

Productions:—Maize, wheat, barley, pulse, sugar, potatoes, coffee, cotton, tobacco, vanilla, flax, indigo, grapes, mahogany, rosewood, ebony, and caoutchouc. Silver and gold, copper, lead, quicksilver, iron, and coal.

Exports:—Silver, gold, flax, hemp, coffee, hides, skins, timber, dye-stuffs, sugar, and drugs.

Imports:—Textile fabrics and machinery.

Guatemala.—Republic; area, 46,000 sq. miles; population, 1,700,000; capital, *New Guatemala.*

Exports:—Coffee, hides, indigo, sugar, indiarubber, mahogany, sarsaparilla, and fruits.

Costa Rica ('Rich Coast').—Republic; area, 23,000 sq. miles; population, 250,000; capital, *San José.*

Exports:—Coffee, sugar, caoutchouc, metals, sarsaparilla, dyewoods, hides, cedar wood, tortoiseshell, and fruits.

Ports:—Punta Arenas on the Pacific, and Port Limon on the Atlantic.

Honduras.—Republic; area, 42,000 sq. miles; population, 500,000; capital, *Tegucigalpa.*

Products:—Mahogany, fruit, cattle, cotton, sugar, tobacco, coffee, indigo, sarsaparilla, hides, skins, indiarubber, and cedar. Much mineral wealth.

Ports:—Truxillo, Puerto Cortez, La Ceiba.

Nicaragua.—Republic; area, 51,000 sq. miles; population, 310,000; capital, *Managua.*

San Salvador.—Republic; area, 7,228 sq. miles; population, 651,000; capital, *San Salvador.*

Exports:—Coffee, indigo, tobacco, sugar, silver, balsam, rice, hides, and cedar.

F.—*History.*

GEORGE IV. AND WILLIAM IV.

Chief events:—

The Cato Street Conspiracy—The Commercial Panic of 1825—Battle of Navarino, 1827—Catholic Emancipation Act—The Reform Bill (very important)—Abolition of Slavery.

The industrial progress and social condition of these reigns require special attention.

G.—*Euclid.*

Second Year.—Book I., Props. 20–23, and work these deductions:—

1. The perpendicular from the vertex on the base of an isosceles triangle bisects the base and vertical angle.
2. The opposite angles of a rhombus are equal.
3. If two isosceles triangles are on the same base, the straight line joining their vertices or that straight line produced will bisect the base at right angles.
4. Find a point in a given straight line such that its distance from two given points may be equal.

Third Year.—Book I., Props. 47 and 48, and work these deductions:—

1. Trisect a given finite straight line.
2. ABCD is a parallelogram, and E, F the middle points of AD and BC respectively. Show that the diagonal AC will be trisected by the lines BE and DF cutting it respectively in the points M and G.
3. Trisect a right angle.
4. If a quadrilateral have two of its opposite sides parallel and the other two equal but not parallel, any two of its opposite angles are together equal to two right angles.

H.—*Algebra.*

Third Year.—'Scholarship Algebra.' Chaps. XIV. and XV.

I.—*Teaching.*

Second Year.—'Scholarship School Management.' Chap. VII., to p. 68. The Teaching of Arithmetic.

Third Year.—'Scholarship School Management.' Chap. XI.

QUESTIONS TO BE ANSWERED.

1. *Penmanship.*—Write as specimens of—
Largehand :—Cato Street Conspiracy.
Smallhand :—'Tis one thing to be tempted, another thing to fall.'
(Take daily practice at this subject from a good model.)

2. Write an essay each week, selecting from :—The study of History ; a stitch in time saves nine ; paws and claws; a steel pen; character ; courage, physical and moral.

3. Notes of Lessons. (A criticism lesson must be given each week.) First Year P.T.'s should write outlines—others full notes.

Paws and claws ; roots ; simple addition ; paper making ; a railway ticket ; a first lesson on the metric system ; a blacklead pencil.

4. *First Year.*
1. Analyse verse 25 and parse *haply, may say, peep, brushing, away, to meet.*
(2) Analyse verse 26 and parse *there, yonder, nodding, so high, would, pore, that, by.*
(3) Analyse verse 27 and parse *Hard by, smiling as, muttering, woeful, like one forlorn, or.*
(4) Analyse verse 28 and parse *morn, another, nor yet beside, was he.*
(5) Give the meaning of the suffix in *Haply, fantastic, listless, length, noontide, wayward, woeful.*

Second Year.
1. Paraphrase lines 243–258 ; 267–276.
2. Analyse (*a*) 245–249, (*b*) 254–258, (*c*) 260–266, (*d*) 272–276.
3. Parse *once again* (243), *methinks* (245), *slow moving* (246), *in letting fall* (247), *other* (249), *just* (253), *save that* (254), *on high* (255), *so* (260), *whom to please* (265), *just* (267), *whole without stooping* (271).
4. Give the meaning of root, prefix, and affix in the following:—*Employed, adorned, ostentatious, resplendent, composure, illumination, uncouthly.*

Third Year.
1. Paraphrase and analyse:—
(*a*) Act IV., Scene 1.
'Octavius I have seen . . . . .
. . . . . graze in commons.'
(*b*) Act IV., Scene 1.
'So is my horse . . . . . .
. . . as a property.'
(*c*) Act IV., Scene 2.
'Thou has described
. . . . . .
Sunk in the trial.'
(*d*) Act IV., Scene 3.
'For Cassius is aweary . . . .
. . . . lovedst Cassius.'

2. Parse—
'Do not talk of him but as a property.'
'Let us presently go sit in council.'
'That you have wronged me doth appear in this.'
'You durst not so have tempted him.'

5. Describe a journey by the Canadian Pacific from Halifax to Vancouver.

6. Contrast and compare British Columbia and Florida.

7. Give ten of the chief towns of the United States, and say what you can about each of them.

8. Give some account of the Peninsular War. Illustrate your answer with a map.

9. What were Nelson's three chief victories? Describe one of them.

10. Under what circumstances was Ireland united in government with England?

11. What was Locke's method of teaching writing? Point out its defects.

12. When should corporal punishment be inflicted in schools, and what care must be exercised in its use?

OCTOBER EXAMINATION, 1897.

SECOND MONTH.

WORK TO BE PREPARED.

A.—*English.*

First Year.

1. The Noun : definitions of the various inflexions. Pay special attention to the various forms or uses of the Objective Case.

2. Anglo-Saxon Adjective Suffixes. Learn not only the meaning but the use.

3. Gray's 'Elegy in a Country Churchyard,' verses 5–8. Be prepared to analyse any part and parse any word. Learn all meanings, allusions, and the derivations of important words.

Second Year.

1. Prepare the Noun fully.

2. Learn one quarter of the Latin Prefixes, with examples.

3. Cowper's 'Winter Evening.' Prepare lines 41–87. *For general paraphrase see above.* Make sure of analysis and parsing, and learn the derivation of all important words.

Notes.

Line 42.—*Such* = Adj. qual. 'evening,' *evening* nom. to (is).
,, 43.—*squeezed* = Perfect Participle qual. *who.*
,, 46.—supply, *Nor such is—evening.*
,, 47.—*to feed* = Infinitive of Purpose. Extension of Pred.
,, 50.—*Folio* and *work.* Nom. in app. with *it* (55).
,, 51.—*Even.* Usually Adv. Here Adj. of Emphasis qual. *critics.*
,, 53.—*Fast.* Adv. mod. *bound*, which is a Participle qual. *I.*
,, 54.—*To break which.* Obj. of *Fear.*
,, 55.—*But* = Preposition gov. *map.*
,, 61.—*Close.* Adv. mod. the adv. phrase *at his heels.*
,, 63.—*but* = *only.* An Adverb.
,, 67.—*to engross.* Extension of the Predicate *ashamed and grieved.*
,, 69.—Supply *is* after *all.*
,, 70.—*At least.* Adverbial Phrase.
,, 73.—*Comes to pass* = the Predicate. *To pass*, Infinitive forming completion of *comes.*
,, 79, etc.—*roses, lilies, teeth, ringlets, Heaven, earth,* and *ocean ; essences, dews, sermons, feasts, airs, journeys, exploits, Katerfelto.* All in apposition with *rest* in line 78.

Third Year.

1. Learn, with examples, the Figures of Speech in common use.

2. Revise the Anglo-Saxon Prefixes, with examples, meanings, and use.

3. 'Julius Cæsar.' Prepare Act I., Scene 3, and Act II., Scene 1, to the end of Brutus' speech, 'of any promise that hath passed from him.'

This will require considerable thought and work on the part of all Pupil Teachers. A play of Shakespeare is not understood and appreciated without effort.

B.—*Arithmetic.*

First Year.

Boys.—Lock. Work all Examples, pp. 65–69.

Girls.—Dixon and Beach. Read carefully Chapter VIII., and work Example VIII. (Practice.)

Second Year.

Boys.—Lock. Work Examples, pp. 136–140.

Girls.—Dixon and Beach. Read Chapter XIV. and work Example XIV.

Third Year.

Boys.—Lock. Chapter XVII. Scales of Numeration and Notation. Learn rules and work all Examples.

Girls.—Dixon and Beach. Read Chapter XXV. and work Example XXV. (Work of Mixed Agents.)

C.—*Music.*

First Year.—The Standard Scale of Pitch.

Second Year.—Bridge Notes and Transitions.

Third Year.—Names of the Chromatic Notes and the principle on which they are named.

(For theory use Stanton's 'P.T. Notes' (Curwen's, 4d.) ; do not neglect the practical part of the work. 'Practical Music for P.T.'s' (Curwen's, 6d.) is an excellent book.

D.—*Spelling.*

Learn 50 words per week from 'Words Commonly Misspelt' (First Series).

E.—*Geography.*

Africa.—The Northern States—viz., Egypt, Tripoli, Tunis, Algiers, Morocco, The Sahara, Senegambia, the Soudan States, and Abyssinia.

Pay particular attention to the productions, industries, people, and towns. Draw a map of each country, and insert all names to be remembered and no others. Egypt is important from our connexion with it, especially at present. Prepare this work thoroughly.

F.—*History.*

Anne.

Chief points:—

(*a*) The War of the Spanish succession, its causes.
Marlborough's campaigns and victories at Blenheim, Ramilies, Oudenarde, Malplaquet, and the Treaty of Utrecht.
A brief life of Marlborough should be prepared.

(*b*) The Union with Scotland, 1707.
Learn the chief clauses in the agreement.

(*c*) The growth of Government by Party. The various intrigues of Whigs and Tories.

G.—*Euclid.*

Second Year.—Book I. Propositions 4, 5, and 6.

Third Year.—Book I. Propositions 30, 31, and 32, and three deductions per week.

H.—*Algebra.*

Third Year.—'Scholarship Algebra.' Read Chapters 5, 6, and 7, and work Examples thereon.

I.—*Teaching.*

Second Year.—'Scholarship School Management.' Chapter I.

Third Year.—'Scholarship School Management.' The Teaching of Geography.

(Test reading by means of the questions at the end of book.)

QUESTIONS TO BE ANSWERED.

1. *Penmanship.*—Write as specimens of:—
Largehargе: Daguerrotype, Extravagantly, Fictitious.
Smallhand:
'I had rather be a dog, and bay the moon,
Than such a Roman.'
(Practise this subject most carefully. Ten minutes per day from a good model, with care, will soon improve any style.)

2. Write an essay each week, selecting from—
Singing Birds—Fairy Tales—Emigration—The Advantages of a Good Education—Good Habits—Modes of Travel.
(Take continual pains with your composition. Send an essay in occasionally for criticism.)

3. Notes of Lessons. (A criticism lesson must be given each week.)
Fish—Insects—Coal—Cotton and its Manufacture—Mouse—Autumn—Bird's Nests—The Milkman.

4. *First Year.*
(1) Analyse verse 5 and parse *twittering, clarion, or, no more shall rouse.*
(2) Analyse verse 6 and parse *ply, care, to lisp, sire's, kiss, to share.*
(3) Analyse verse 7 and parse *oft, has broke, how jocund, did, afield, how.*
(4) Analyse verse 8 and parse *let, ambition, mock, nor, hear, poor, annals.*
(5) Write notes on *curfew, lea, drowsy tinklings, moping owl, her ancient solitary reign, rude forefathers.*

Second Year.
(1) Paraphrase and analyse lines 42–49 and parse *such* (42), *squeezed* (43), *both* (44), *to feed* (47), *all tranquillity* and *smiles* (49).
(2) Paraphrase and analyse lines 50–58 and parse *happy work* (50), *e'en* (51), *fast bound* (53), *yet, to break* (54), *what, but* (55), *ambition* (58).
(3) Paraphrase and analyse lines 66–72 and parse *to engross, notice* (67), *however trivial all* (69), *bashfulness at least* (70).
(4) Paraphrase and analyse lines 78–87 and parse *wilderness* (78), *but, roses* (79), *plundered* (82), *wondering for his bread* (87).
(5) Write explanatory notes on the following:—*The herald of a noisy world—The fall of stocks—Fluent quill—Have our troops awaked—Is India free—The popular harangue.*

Third Year.
(1) Analyse and paraphrase—
(*a*) Act 1, Scene 3.
'You are dull, Casca . . .
. . . unto some monstrous state.'
(*b*) Act 1, Scene 3.
'I know where I will wear this dagger then
. . . I can shake off at pleasure.'
(*c*) Act 2, Scene 1.
'It is the bright day . . .
. . . By which he did ascend.'
(*d*) Act 2, Scene 1.
'Since Cassius first . . .
. . . the nature of an insurrection.'

(2) Parse—
'How that might change his nature, there's the question.
'So Cæsar may; then, lest he may, prevent.'
'For if thou path, thy native semblance on,
Not Erebus itself were dim enough
To hide thee from prevention.'

(3) Write notes on *The feast of Lupercal—The Ides of March—There was a Brutus once—Æneas our great ancestor—Like a Colossus—Cicero—The falling sickness.*

5. Give an account of the rivers and lakes of Africa.

6. Who are the following:—The Haussas, Berbers, Copts, Masai, Zulus, Hottentots, Negroes, Kaffirs, and Boers.

7. Explain the causes which led up to the Massacre of Glencoe. Why did Scotland and Ireland respectively support James II.?

8. What were the provisions of the Mutiny Bill, Triennial Act, and Act of Settlement?

Second Year.

9. What do you understand by 'Memory'? How may it best be trained?

Third Year.

10. In what way should Grammar be taught? Illustrate your answer by reference to a lesson on the Adjective.

SCHOLARSHIP COURSE.

11TH MONTH—NOVEMBER 1896.

1. *Penmanship.*—Take ten minutes' practice daily from a good model.

2. *Dictation.*—Write the following from dictation:—

In our own country we have a happy example of a system which combines the best features of monarchy and republic—the splendour of one and the freedom of the other. Our own constitution has been called 'a veiled republic,' and the epithet seems to describe it truly. We have all the advantages that may accrue from the presence among us of a titular hereditary sovereign; and we have the great privilege of being able, through our elected representatives, to control our national affairs. Our constitution has all the elements of permanency; perfect freedom exists among all classes within our shores; we have passed through all the intermediate stages between barbarism and civilisation; liberty and enfranchisement have been gradually extended until all have now their share in the privileges of Englishmen and citizens, and Britain may well be described, as the laureate has so forcibly described it, as a land—

'Where freedom slowly broadens down,
From precedent to precedent.'

The guidance and control of a nation is a sacred trust, and no sovereignty, either of autocrat or senate, can be prosperous unless it is broad based upon the people's will, which condition is above all things necessary to give it strength and stability.

3. *Composition.*—Write one or two essays each week, selecting from—

Public Speaking—Choice of a Profession—The New Photography (a very likely subject)—Necessity is the Mother of Invention—Hospitality—Our Colonies—The Various Forms of Governments.

(Great care must be taken with this subject, as it is universally weak, to judge from the majority of essays submitted.)

Model Essay on *International Arbitration.*

From the earliest ages the usual method of settling disputes has been by brute force, and 'right' has usually had to submit to 'might.' The enormous loss of life, and all the horrors attendant upon war, have had apparently but little deterrent effect upon mankind, for it is doubtful whether at the present time the ingenuity of man is more exercised in devising means to ameliorate his position, or in contriving machinery by which he can be destroyed. Nevertheless, the conviction is growing steadily upon the minds of thinking people, that some method might be adopted whereby a settlement could be arrived at, without the useless and criminal effusion of blood.

It is between nations that brutal strife is mainly carried on. The laws of the various civilised countries prevent individuals from indulging in such pastime, and provide various courts of law by which disputes can be finally settled; in fact, the whole of our legal system is devised in order to adjudicate between man and man. Not only are these personal differences effectually disposed of, but on more than one occasion arbitration has successfully terminated a quarrel existing between large numbers of men. Strikes and lock-outs are frequently averted or stopped by this means, and the unanswerable argument presents itself—'If this means disposes of difficulties in such cases, why should it not be applied to the disputes between nations?'

In the many cases in which it has been resorted to, as for example the Alabama Claim, the result has been entirely satisfactory. Surely in the present advanced state of civilisation, nations, or rather their rulers, would be amenable to reason.

Supposing such a case to occur as the recent embroglio with Venezuela, it certainly should be possible to constitute, by mutual consent, a court of neutral judges, who could examine the statements and arguments of both sides, and arrive at an entirely unbiassed decision.

A permanent court of arbitrators would hardly be necessary; they might be appointed as necessity arose. The only difficulty which appears is the question whether in all cases the party against whom a verdict had been given would acquiesce in the decision. This could be overcome by all the Great Powers uniting in insisting upon the decision being loyally accepted.

It is sincerely to be hoped that this more enlightened method of disposing of animosities may soon be permanently introduced, and that the time may be ushered in when 'The war drum throbs no longer and the battle flag be furled, in the parliament of man.'

4. *English.*

(*a*) Learn 20 roots and meanings each week.

(*b*) Revise the grammar of the Adjective and Adverb, and look up questions below.

(*c*) *Literature.*—Revise the Early English period (1066–1485), paying particular attention to Chaucer and the influence which his writings had upon English literature.

1. Examine and illustrate the etymology of any five of the following words:—

Traveller, visage, passions, survive, despair, level, boundless, lone, decay, colossal, desert, lip, pedestal.

2. Show by definition and examples what is meant by (*a*) substantive, (*b*) intransitive, (*c*) passive, (*d*) defective, (*e*) strong (irregular), and (*f*) weak verbs. To which of the two last-named classes would you refer the verbs *to lead, to spread, to show, to sweep, to spend*, and why?

3. Give definitions of an Adverb, a Preposition, and a Conjunction, and show by examples the difference between each of them and the other two. Can you mention any words belonging to these three classes which cannot be parsed without knowing their position in a sentence?

4. Give a short historical sketch, with dates, of the origin and growth of the English language.

5. Distinguish common, proper, and abstract nouns; cardinal and ordinal numbers; intransitive and neuter verbs; continuative and disjunctive conjunctions; personal, possessive, reflexive, and relative pronouns.

6. It is often said that English is less of an inflected language in its later than in its earlier stages. Explain what is meant by this, and give a few instances of inflection in English as now spoken.

7. Show by examples how analysis helps us to parse correctly.

8. At what periods, and in connection with what events, in the history of this island, did the most important changes take place in the language of its inhabitants? Illustrate your answer.

9. Name six of the most famous English writers. Say when each of them lived, and what book he wrote.

10. Take each of the following words, and add to it a prefix or a suffix. Explain in each case what change in the meaning of the word has been effected by the additional syllable.

Just, admire, faith, pure, brother, friend, sincere, wise, heard, speak.

11. Explain each of the following grammatical terms, and give an example illustrating its use:—Infinitive, Relative, Apposition, Government, Predicate, Dative, Subjunctive, Transitive, Inflection.

12. Show by example the different uses which may be made, in English, of the words 'what' and 'that.'

13. If you think there is anything wrong in any of the following sentences, correct it, and give your reasons.

(*a*) I should have liked to have seen so fine a sight.
(*b*) I do not think him a reliable person.
(*c*) There let him lay.
(*d*) Preferring to know the worst, than to dream the best.
(*e*) The courage of the soldier and of the citizen are essentially different.
(*f*) Each thought of others rather than themselves.
(*g*) The orator spoke of the notion that the national debt might be repudiated with absolute contempt.

14. How do you account for the presence in English of so many words of Latin origin? Say by what token, either as regards spelling or construction, you can recognise that an English word is derived from Latin; and give some examples.

15. Who were the chief dramatists who wrote during Elizabeth's reign?

16. Classify Adjectives. How are they inflected? How would you parse the word *white* in the sentence, 'I painted my house *white*'?

17. Give the meanings of the prefixes *extra-, ob-, be-, for-, ante-*. What do the suffixes *-ster, -ish, -out, -let, -al*, denote respectively? Give an example in each case.

18. In what different ways may the infinitive mood be used? Give examples.

19. Name the different classes of Conjunctions and give an example of each.

20. Explain briefly the distinction between *shall* and *will*. Comment on the following, 'I will be drowned and nobody shall save me.'

21. If you see anything wrong in the following sentences, correct them and give your reasons:—

(*a*) I never remember to have seen him before.
(*b*) They deserve to receive condign punishment.
(*c*) Please to send either a written or verbal reply.
(*d*) I intended to have pointed this out yesterday.
(*e*) He hoped everyone had enjoyed themselves.
(*f*) The climate is as good, or even better than that of Madeira.

22. Give several words in which the following syllables are contained, and show, in regard to each group, what is the common element of meaning, and from what language the words are derived:—

Phil, rect, dom, tele, sent, tract,

23. Point out the difference in meaning between the words in each of the following pairs, and put each into a sentence of your own construction:—

Reverend and Reverent.	Permissive and Permissible.
False and Fallacious.	Benevolent and Beneficent.
Apathy and Antipathy.	Distinct and Dissimilar.

24. Give some rules for determining the case of relative pronouns in a sentence, and give examples of sentences containing relative pronouns in different cases.

25. Correct, if necessary, any of the following sentences, and give your reasons:—

(*a*) How sweet the moonlight sleeps upon this bank.
(*b*) I am sorry to differ with you.
(*c*) He is averse to the proposal.
(*d*) For thou art a girl as much brighter than her,
As he is a poet sublimer than me.
(*e*) These are the two persons whom we thought were far away.
(*f*) This England never did nor never shall
Lie at the proud foot of a conqueror.

26. Name the chief writings of the following authors:—Bacon, Pope, Johnson, Hume, Macaulay, and say when each of these writers lived.

27. Explain the meaning of each of these terms and make sentences containing illustrations of their use: *Passive, Antithesis, Co-ordinate, Apposition, Infinitive of Purpose, Demonstrative, Ellipsis.*

28. State the requirements of the Code under the head of 'English' in Standard III., and show how the lessons may be utilised so as to teach the children to frame sentences and to speak correctly.

29. From each of the words 'joy,' 'glory,' 'true,' 'wise,' form three other words by the addition of a suffix, introducing each word into a short sentence.

30. What do you mean by comparison of adjectives? When ought the comparative and when the superlative form to be used? What classes of adjectives do not admit of comparison?

31. Say what you know of any two of these writers:—Bacon, Johnson, Pope, Macaulay, and what books they wrote.

32. Explain the *case* of the words printed in italics in the following sentences:—

(*a*) He gave me *what* I wanted.
(*b*) The book is *mine.*
(*c*) *Him* the Almighty power
Hurled headlong.
(*d*) He *whom* thou lovest is sick.
(*e*) He was chosen *secretary.*
(*f*) *Weather* permitting I shall travel to-morrow.

33. Give examples, from any poem you have read or learned, (1) of simile, (2) of metaphor, (3) of personification.

34. Name any important books which were written in the eighteenth century, and say what you know of the authors of any two of them.

35. Distinguish between the meanings of the following words and use each in an appropriate sentence:—

allusion	illusion
compliment	complement
continual	continuous
deference	difference
influence	affluence
luxuriant	luxurious
prosecute	persecute
sufferance	suffering
urban	urbane.

36. Quote any passage, not exceeding ten lines, from any standard English poet (excluding Shakespeare and Milton) that you consider especially noteworthy on account of beauty of diction, and justify your selection by adequate reasons.

37. Comment on the following words, giving illustrations where you can, of similar grammatical forms:—*Afoot, yclept, twain, chode, kine, gotten, prithee, wot, hindmost.*

38. Chaucer has been called 'the finder of our fair language.' Illustrate and amplify this statement.

5. *Arithmetic.*

Read up any weak points in theory. Work as many general examples or back papers as possible, and work test paper below.

6. *Algebra.*

Boys.—'Scholarship Algebra,' Chaps. 24, 25, and 26, with examples. Work test paper below.

Girls.—'Scholarship Algebra,' Chaps. 17–20, and work examples.

7. *Mensuration.*—The mensuration of the circle.

8. *Euclid.*—Revise Book II., Props. 8–14, and work 4 deductions per week.

9. *Geography.*—Revise Geography of Scotland and Ireland.

Practise memory maps regularly.

Read up and tabulate the imports and exports of the Colonies, with the chief ports.

Prepare answers if necessary to the following questions:—

(1) Name the chief ports of Ireland, with notes on their manufactures and trade.

(2) Give an account of the rise, progress, and present state of the woollen *or* iron manufacture in Great Britain.

(3) When and under what circumstances was the Punjaub annexed? Mention four towns in it, the rivers on which they stand, and some points of interest in their history.

(4) What are the chief articles of export from India to Great Britain? From what parts of India do they come?

(5) How is Cape Colony governed? Is it well suited for agriculture? What minerals are found in the Colony? Describe its climate.

(6) Describe the principal mountain chains of Australia, with its vegetable and animal productions.

(7) Where, on what rivers (if any), and for what noted are:—Aden, Ballarat, Chester, Colombo, Drogheda, Dunedin, Fredericton, Georgetown, New Westminster, Singapore?

(8) Say what you know of the Hudson Bay Company, and the East Indian Company.

(9) What parts of the Empire are at present administered by Chartered Companies? Explain the term.

(10) Say what you can of *six* of the following:—Ottawa, Christchurch, Limerick, Braemar, Ballarat, The Bahamas, Montreal, Natal, Upper Burmah, Benares, and Aden.

(11) Trace by means of a map the course of the Ganges, *or* the St. Lawrence.

(12) Who are the Parsees, Hindoos, Maories, North American Indians, and Zulus, respectively?

(13) How are the revenues of the Government obtained in India, and what great public works are carried out by the Government in that country?

(14) What are the principal railways in India? Describe a journey by one of them.

(15) Give some account of our first settlement in India, and of the successive additions to our possessions there.

(16) What are the principal industries of the people in (*a*) Jamaica, (*b*) Cape Colony, and (*c*) Tasmania.

(17) Describe, with the aid of a map, the great Lakes of British North America.

(18) 'England has many small possessions at the extremities of continents, or at points round which commerce passes.' Explain and illustrate this.

(19) Say what you can of *five* of the following:—Lucknow, Port Elizabeth, Ottawa, Poonah, Brisbane, Punjaub, St. Helena, Winnipeg, Fiji Islands, and Barbadoes.

(20) Who are the Bushmen, Red Indians, Cingalese, French Canadians, and the Sikhs, respectively?

10. *History.*—The Commonwealth.

Chief Points:—

The Reduction of Scotland and Ireland.
The Naval War with the Dutch.
Capture of Jamaica.
Cromwell's Foreign Policy and Home Government.
The Changes in the Form of Government. Cromwell's Parliaments.
The Interregnum.

Prepare answers to the following where necessary:—

Selected Scholarship Questions.

(1) Give a short sketch of the History of the Norman Conquest of England.

(2) Write an account of the character of King Edward III., and mention the leading events of his reign.

(3) What do you know of the dwelling-houses, dress, amusements, and domestic habits of Englishmen in the time of the Tudors?

(4) What is meant by the 'Revival of Learning'? When did it take place, and to what cause is it to be attributed? Mention some of the leaders in the movement in England and elsewhere.

(5) Mention the chief warriors, statesmen, and writers who flourished in the reign of Elizabeth, and give a particular account of one of them.

(6) Write a brief account of the reign of Henry VIII., illustrating especially the despotic character of his reign.

(7) Sketch the character of Henry V., and give an account of his conquest of France.

(8) What was the relationship of Mary I. to her husband, Philip of Spain, and of Mary Queen of Scots to her husband, Lord Darnley? Give genealogical tables in each case.

(9) Give as clear an account as you can of the cause of any *two* of the following popular outbreaks:—The Pilgrimage of Grace, Jack Cade's rebellion, the risings in the time of Edward VI.

(10) Explain what is meant by the Star Chamber, Act of Supremacy, Poyning's Law, Royal Prerogative.

(11) Compare Henry II. and Edward I. with regard to—
(*a*) Extending the dominions of the Crown.
(*b*) The administration of justice.
(*c*) Relations with the clergy.

(12) Who was the wife of Henry II., Edward II., Henry VI.? Which of these kings acquired or lost territory by marriage? What active part in historical events did their wives take?

(13) Mention, with dates, risings in the times of the Tudors which were due to discontent caused by religious changes, taxation, or poverty. Mention (*a*) causes which in that period produced distress and vagrancy, (*b*) any measures taken to meet these evils.

(14) Give a summary of the relations of King and Parliament throughout the Tudor period.

(15) What were the general objects of the following :—Salisbury Decree (1086), Constitutions of Clarendon (1164), Magna Charta (1215), De Religiosis (1279), Statute of Labourers (1349), Statute of Kilkenny (1357), Statute of Supremacy and Uniformity (1559).

(16) Trace the relations between England and Scotland at the following epochs :—Edward I. to Edward III., Henry VII. and VIII., Elizabeth.

11. *School Management.*—'Scholarship Sch. Man.,' Chap. XII.

12. *Domestic Economy.*—Revise Clothing and Washing.

13. Revise any parts of *Le Trésor* not known. (A translation can be obtained from Hachette & Co., King William St., Strand, W.C.).

QUESTIONS TO BE ANSWERED.

1. Write as specimens of—
   (*a*) Largehand.—Armenian Massacres.
   (*b*) Smallhand.—How noble 'tis to suffer and be strong.

2. Analyse the following and parse the words in italics :—

> 'He it was, *whose* guile
> Stirred up with envy and revenge, deceived
> The mother of mankind ; *what time* his pride
> Had cast him out of heaven with all his host
> Of rebel angels, by whose aid, *aspiring*
> *To set himself* in glory above his peers
> He *trusted to have equalled* the Most High,
> If he opposed.'

3. 'The structure of the land, together with the latitude, causes the interior of Australia to be one of the most arid regions of earth.' Explain and illustrate this, and compare the climates of Queensland and Victoria.

4. Give a detailed description of the industries, the form of government, and the system of education in *one* of the provinces of Canada.

5. What were the chief points at issue between Charles I. and his parliament after he had given his assent to the Petition of Right? What part did Ireland and Scotland play in the subsequent war?

6. Give a short account of the parliaments known as :—The Mad, the Good, the Wonderful, the Short.

7. *Arithmetic.—Boys and Girls.*
   (1) (*a*) How would you briefly explain the rule for dividing one vulgar fraction by another?
   (*b*) Give a general rule for the division of decimals.
   (*c*) What is the general form of the denominator of a fraction which can be expressed as a terminating decimal?
   (*d*) Define ratio, present worth, average.
   (*e*) State briefly the advantages and disadvantages of decimalising the coinage of the country.

   (2) If $\frac{1}{2}\frac{3}{7}$ of $\frac{3}{5}\frac{9}{6}$ of 2s. $1\frac{1}{2}$d. be taken from $\frac{3}{7}$ of $\frac{2}{3}\frac{1}{3}$ of 7s. 4d., what fraction of 17s. 8d. will remain?

   (3) Find the cost of papering a room 31 ft. 4 ins. long, 17 ft. 3 ins. wide, and 13 ft. 6 ins. high, with paper $\frac{3}{4}$ of a yd. wide at 1s. $10\frac{1}{2}$d. per piece of 15 yds. Deduct 12 sq. yds. from the area of walls on account of windows, etc.

   (4) If a man walks 252 miles at the rate of $3\frac{1}{2}$ miles per hour for 8 hours a day, find how many hours a day another man must walk at the rate of $4\frac{1}{2}$ miles an hour in order to walk 243 miles in the same time.

   (5) A ship 78 miles from shore springs a leak which admits $2\frac{1}{2}$ tons of water in $6\frac{1}{2}$ minutes ; 68 tons would suffice to sink her, but the pumps can throw out 15 tons per hour. Find the average rate of sailing that she may just reach the shore as she begins to sink.

   (6) If the manufacturer makes a profit of 20 per cent., the wholesale dealer a profit of 25 per cent., and the shopkeeper a profit of 40 per cent., what was the cost of making an article which can be bought for 17s. 6d. ?

   (7) If £3,256 15s. be paid for £3,908 2s. due 5 years hence, what is the rate of interest (simple) ?

   (8) A man invests half his capital in the $2\frac{1}{2}$ per cents. at 88, and the other half in the 4 per cents. at 116, and his total income from both sources is £642. What was his capital? (Neglect brokerage.)

Answers.—(2) $\frac{1}{4}$; (3) £1 2s. $3\frac{1}{2}$d. ; (4) 6 hrs. a day ; (5) $7\frac{1}{2}$ miles an hour ; (6) 8s. 4d. ; (7) 4 per cent. ; (8) £20,416.

8. *Algebra.—Test Paper.*
   (1) Prove that the difference of the cubes of any two quantities divided by the difference of their squares = sum of the two quantities — their product divided by their sum. Point out the difference between the algebraical proof of this proposition, and the arithmetical illustration afforded by the substitution of numbers for the two quantities.

   (2) Resolve into elementary factors :—
   (*a*) $x^2 - 14x - 51$.
   (*b*) $x^3 - 72$.
   (*c*) $(x + a)^4 - (x - a)^4$,
   and prove that $a^3(b - c) + b^3(c - a) - c^3(a - b) = (a + b + c)\{a^2(b - c) + b^2(c - a) + c^2(a - b)\}$.

   (3) If a quantity is a factor of both a and b it is also a factor of $ma \pm nb$.
   Find the G.C.M. of
   $4x^3 - 27x^2 + 58x - 39$ and $x^3 - 8x^2 + 19x - 12$.

   (4) Simplify
   $$\frac{a}{b} - \frac{a^2 - b^2}{b^2}x + \frac{a(a^2 - b^2)x^2}{b^2(b + ax)},$$
   and find value of
   $$\left(\frac{x}{x-1}\right)^2 + \left(\frac{x}{x+1}\right)^2 \text{ when } x = \sqrt{\frac{a-b}{a+b}}.$$

   (5) Find the square root of
   $16x^6 - 24x^5 + 33x^4 - 50x^3 + 33x^2 - 24x + 16$.

   (6) Solve
   (*a*) $$\frac{a}{x-a} + \frac{b}{x-b} = \frac{a+b}{x-a-b}.$$
   (*b*) $$\frac{1}{x^2-1} - \frac{1}{1-x} = \frac{7}{8} - \frac{1}{x+1}.$$

   (7) A number (n) is divided into three part such that one-third of the number exceeds the first part as much as the second part exceeds one-fourth of the number. Find the third part.

Answers.—(1) Book work. (2) $(x - 17)(x + 3)$; $(x - a)(x^2 + 9x + 81)$; $8ax(a^2 + x^2)$. (3) $(x - 3)$. (4) $\frac{a + bx}{b + ax}$; $\frac{a(a-b)}{b^2}$. (5) $4x^3 - 3a^2 + 3x - 4$. (6) $\frac{a+b}{2}$; 3 or $-\frac{5}{7}$. (7) $\frac{5n}{12}$.

9. Write an essay on handwork and headwork in schools ; or, Life on the Sea.

10. Write notes of a lesson on Early Hours, Digestion, or the Need of Obedience in Schools.

11. An invalid is advised to abstain for a while as far as possible from nitrogenous food. What diet is best suited for such a person, and why?

12. What are the advantages of stewing meat? Give recipe for an Irish Stew.

13. Distinguish between 'articulation,' 'emphasis,' and 'pronunciation.' What methods would you adopt to ensure that these shall be 'clear,' 'just,' and 'correct' respectively?

14. How can an appeal be made to the eye in teaching division of fractions? Why should fractions be taught before proportion?

15. *Music.*
   No marks should be lost on this subject. A little care is all that is needed. The following are some selected questions :—
   (1) Re-write the following—(1) halving the value of each note and rest, and (2) doubling the value of each note or rest :—

(*a*) | s :-.m | s :d' | s : — | — : — ||

(*b*) | s :f.m | r :-.f | m :r | :d ||

(*c*) | s : — | :m | f :-.t_1 | d : — ||

(*d*) | m :-.f | s : — | :r | d : — ||

(*e*) | m.f :s | : .d | f :-.s | m : — ||

(2) Describe the intervals (major third, etc.) formed by the following pairs of notes :—

ſf ɾd	ſt ɾf	ſn ɾd	ſl ɾn	ſd' ɾn	ſde' ɾn	ſd' ɾre	ſra ɾr
ſse ɾn	ſf ɾs,	ſd' ɾse	ſse ɾt,	ſta ɾr	ſf ɾt,	ſs ɾr	ſt ɾn
ſse ɾf	ſl ɾf	ſra ɾd	ſt ɾd	ſta ɾs	ſf ɾl,	ſse ɾr	ſf ɾse,
ſf ɾde	ſd' ɾre						

(3) If the first note of each of the following passages is regarded as t_1, what will the others become?

(*a*) fe s r l t d' fe l fe n d t_1

(*b*) n f s ta l d' ta l s ta l n f

(4) Write a descending minor scale (*Lah* mode), using minor or occasional seventh, and minor or essential sixth.

(5) Give the mental effects of *fah*, *lah*, and *soh*; *te*, *me*, *ray*.

(6) State which notes of the common (major) scale are altered by the Lah or Minor Mode.

(7) Name the major sixth and minor seventh of the Lah or Minor Mode.

(8) Name the minor sixth and major seventh of the Lah or Minor Mode.

(9) Name the strong and leaning tones of the scale. Which tones have the greatest leaning tendency?

(10) What is the name for (1) *doh* sharp, (2) *te* flat, (3) *fah* sharp, (4) *me* flat?

(11) What is the name for (1) *ray* sharp, (2) *lah* flat, (3) *soh* sharp, (4) *me* flat?

(12) Name the following relations of the minor or *lah* mode :—(1) Dominant; (2) Minor or essential sixth; (3) Leading note or essential seventh; (4) Supertonic.

(13) Which of the following tones is highest in pitch and which lowest?—

(*a*) f in key C; (*b*) r in key G; (*c*) l in key B♭; (*d*) f_1 in key A; (*e*) t_1 in key D; (*f*) s in key F; (*g*) r' in key E♭.

(14) Work the following values in three-pulse measure. The figures show duration in pulses or fractions of a pulse. Begin on a strong pulse :—

1	¾	¼	1	1½	½	½	½	2	½	½	½	1½	½	1	½	½	1	1	2	1
s	d	r	n	f	n	r	REST	l	r	n	f	s	n	d	r	n	f	t_1	d	REST

(15) Write (in figures) very distinctly over each note and rest in the following its value in pulses or fractions of a pulse :—

| n.	:f .,s	:n.f,s	| l	:-.s,f	:n.s	|
| f_1.-,s	:n	:d	‖			

CORRESPONDENCE.

1. Individual assistance will be given as far as possible by advice, solution of difficulties in any subjects, model answers, etc.
2. Specimens of Writing, Paraphrasing, Maps, Composition, etc., will be marked and criticised gratis.
3. To assist students in rural districts, Freehand or Model Drawings will be corrected and marked, with hints for improvement, etc., and returned if accompanied by a postage stamp.
4. As a rule, all replies will appear in the Correspondence Column, but anyone desiring an immediate reply may obtain it by enclosing a stamped addressed envelope.
5. To ensure an answer in the next issue queries must be sent by the 15th of each month.
6. Name and address of sender, with coupon of current number of the PRACTICAL TEACHER, and *nom de plume* if desired, must be enclosed.

All communications and queries with regard to the PUPIL TEACHERS' AND SCHOLARSHIP COURSE should be addressed to 'A. T. FLUX, 12, Lower Park Road, Belvedere, Kent.'

ANSWERS TO CORRESPONDENTS.

A.W.P.—(1) A very good map. I should give it full marks; (2) The common irregular verbs should be known. (3) You can get the spelling book from John Marshall's, Paternoster Row; price 1d. each. (4) 80 per cent. marks for writing.

DONALD.—55/60; *p* and *g* largehand too long.

VERAX.—See above in October course.

P.T.—See above. It is impossible to deal with all the points in *Julius Cæsar* in these columns. You must send up your difficulties.

PUZZLED.—*As.*—Conj., Subord. Adv., joining 'you took his life,' and 'being a foe.'

being.—Imperfect Part. of the verb *to be*, attributed to *his*.

fool.—Noun, common, Nominative case after *being*.

as.—Conj. Subord. Adv., joining sentences 'Yet bury him' and 'a prince is buried.'

prince.—Noun, nom. to *is buried*, understood.

SCHOLARSHIP.—Map 80 %. Shade coast with a little blue lead. Penmanship 45/60. The small-hand copy should be larger.

CYMRU.—Writing 55/60. Map 75%. Printing lacks neatness.

$(A + B)^2$.—A very good essay, but much too long, 55/60. Writing 50/60. Will try to insert what you ask for.

G.W.B.—Essay 55/60. Writing should be kept more together.

FULK.—Essay 48/60. General writing poor and scratchy. Too much space between words. Penmanship 25/60. Practise from a good model daily, and pay more attention to detail.

M.A.T.—Penmanship improved. Pen still held sideways. 35/60. Arithmetic better, but not yet up to standard.

NIL DESPERANDUM.—Penmanship 40/60. Small-hand poor; pay more attention to details. Needlework will be criticised. Grammar 90%.

IGNORAMUS.—Penmanship 50/60. Essay 55/60. The paper supposed to be issued in 1588 has been proved a forgery of a much later age.

L.L.—Grammar 85%. *When* is a connecting word not an extension?

OXON.—Writing 35/60. Lack of firmness and character. Practise from a good model. Dictation 90%. Punctuation needs attention. Do not attempt this while writing, but wait till concluded.

BRITON.—Writing 55/60. Avoid crowding. A very good essay, 60/65. You have adopted just the right line of thought.

W.G. (Golcar).—Your suggestions shall have my best attention, although I cannot promise all that you ask for.

H.A.D.—Writing loose and irregular, 40/60. Essay 55/60. Good ideas well expressed.

SHEELA.—Essay 1, 35/60. Defoe was not the first newspaper writer. Essay 2, 45/60. Divide into paragraphs, each dealing with some particular topic or view of the subject. Writing 40/60. Very stiff style.

(NAME MISLAID).—Essay 50/60. Writing 60/65. Map 45/50. Keep names horizontal. Grammar 47/50. On the whole, very creditable work.

ANSWERED BY POST.—K.J. (Trefeinig); Miss M. (Hastings); J.B., F.T. (Chester); H.J. (Govan); M.W. (Newport); C.V.H. (Hartlepool); L.B. (Hassocks); N.A.B. (Bradford); A.D. (Doncaster); M.B. (Shields); J.W.G. (Lancaster); R.C. (Wycombe); R.P. (Braintree); E.L.C. (Swansea Valley); J.C. (Plymouth); P.A.R. (Earlston); H.H.P. (Weymouth); E.C. (Worcester); J.S. (Earlston); A.L. (Bridlington); S.C. (Leytonstone); C.S. (Wallsend); A.W. (Attleborough); F.A.P. (Enfield); M.L. (Uppingham); M.H. (Godmanchester); P.A.R. (Blinkbonny); T.H. (Walthamstow); E.S. (Peckham); W.W. (Newton); A.M.V. (Coleford); K.D. (Stafford); E.E. (Blaengawr); J.J. (Dowlais); E.H. (Longmurston); M.A.E. (Highgate); W.M. (Dysart); F.W.G. (Bristol).

Another beautifully printed Natural History Object Lesson Sheet will be presented with our December Number. Subscribers are asked to order early, as these Coloured Diagrams cannot be reprinted after the issue is out of print.

NOTES AND NOTIONS.

BY T. B. ELLERY,
Ex-President of the National Union of Teachers.

Teachers' Superannuation Bill. For obvious reasons I refer but rarely to the question of Superannuation. It has 'passed beyond the stage of controversy or dispute,' to quote Sir John Gorst (August 28th, 1895). My pocket-book ('Superannuation *Special*') is nearly full of references, promises, and pledges, and if a Bill is not speedily introduced, I must certainly invest in a new book! Have you a copy of Sir William Harcourt's letter to Mr. Yoxall (July 2nd, 1895)? No! Well, here it is:—'Dear Mr. Yoxall,—It is a great disappointment to me that the sudden termination of our official existence prevented the public announcement of my decision to introduce a Bill for provision for Teachers' Pensions. The authority was given in the Treasury some time ago to draw the Bill, which has been done generally upon the lines of the Report of the Departmental Committee. I am sorry that we did not survive long enough to carry out this necessary good work.'

August 28th 1895. And have you Union stalwarts and indefatigables a Report of the Debate in the House of Commons on August 28th 1895, when Superannuation was once more referred to? If not, make a note of this, and in your interview with your local M.P., use it! Mr. Acland, after expressing a hope that it would not be a party question, a sentiment which was received with hearty approval on both sides of the House, went on to say:—'If we are to maintain the efficiency of the schools and enable the teachers (who themselves contribute towards the pensions under the scheme) to retire at a reasonable age, this is one of the first claims we must make on the Treasury in the matter of Education.' Make also a note of what Sir John Gorst said on that occasion:—'I have no reason to think that the present Government will on this subject come to any different conclusion than that which the late Government arrived at, and I think the House may feel a tolerable amount of confidence that next session a measure will be laid upon the table, differing in no essential particular from that prepared by the late Government. If the measure is received by the House in the spirit in which I think it is likely to be received, there is no reason why it should not speedily pass into law.'

As we know, the 'next session' came and no Bill was introduced, but Sir John Gorst on several occasions declared that the mind of the Government had not changed.

Local officers! See that your Members of Parliament have full information in their possession. Many applications have reached me for copies of the Executive's pamphlet on Superannuation, containing a report of the Debate in the House, my Paper read at the Liverpool Conference, press opinions, etc. My stock is exhausted, and all applications for copies must be made to the General Secretary, 71, Russell Square, W.C.

Brighton School Board Election. Mr. Baseden's re-election, with such a record of votes as he received, is a striking testimony to the value placed upon his services by the people of Brighton. For many years he laboured in their midst as the head master of one of the schools in the town. Then came the demand of the Board for his resignation, and with it an overwhelming expression of feeling in his favour from the public. As my readers are doubtless aware, he was a candidate for a seat on the School Board at the election in 1893, and was returned at the top of the poll by a tremendous majority. Then came his election as chairman, an office he has filled with dignity and success. For the second time he has been triumphantly returned, and I am confident he will continue to give a good account of himself. A word of praise is due to his election committee, and especially to the chairman of that committee, Mr. J. F. Blacker, a member of the Executive of the N.U.T., and a candidate for the Vice-Presidency at the next election.

Diocesan Inspection. It is time, it seems to me, that the Executive of the N.U.T. took in hand the question of the annual examination of schools in Religious Knowledge. I had hoped that my references to it in my Presidential Address (Manchester) would have set the ball rolling. For a time, indeed, there was a movement on the part of many correspondents and several local associations, but of late nothing apparently has been done. It is possible the Executive does not touch it because the outside public, especially the enemies of the N.U.T., might say—'These teachers object to religious instruction.' If this were really believed by any large section of the public, the Union would be seriously damaged. I do not think, however, there is any danger. The preparation for examination in religious knowledge is not the most healthy training a child can receive. The teacher has little time—with the annual examination staring him in the face—for that higher and more spiritual training which should be the birthright of every boy and girl in Christian England. And though my own school was classed 'Excellent' year after year, I protested, and I still protest that the annual examination is a stumblingblock, a hindrance, and not a help. The Education Department has been convinced that Inspection is a far better test than Examination. When will the Diocesan Boards of Education arrive at the same healthy conclusion? The annual field day is now, with the Department, practically a thing of the past; the examination in Drawing will also go, I believe, and then 'My Lords' should insert a provision in the Code, that in no grant-aided school shall an annual examination in religious knowledge be permitted. That would settle the question once and for all.

A Diocesan Inspector. In my Manchester address I referred to a Diocesan Inspector who had been found guilty of very unsatisfactory performances, with respect to the examination of a certain school which had been classed 'Excellent' for about eighteen years by some five or six different Inspectors. The Managers, being honest men, invited another Inspector to undertake the work when the examination day came round again. The result was again 'Excellent,' and the report, a very gratifying one. Then, the following year, the former Inspector was permitted to resume his work in that school, the Managers thinking there would be no repetition of the unsatisfactory state of affairs of the year before. The lads were better prepared (from the examination point of view) than ever, the Managers had assisted in the teaching, and had tested it from time to time, but the Inspector gave a comparatively unsatisfactory verdict, and classed the school 'Good.' This was quite enough for the Managers, who, at their first meeting after the inspection, passed a resolution that other arrangements be made for the future. With other Managers the teacher would have been ruined. I am far from saying that this sort of thing obtains generally, for I am well aware that as a body, the Diocesan Inspectors are sympathetic in their work, and endeavour to make their visit a day of pleasure for all concerned. But there are some who are so inflated with their own importance, so full of contempt for the elementary school teacher, and so suspicious, overbearing, and exacting, that from the time they enter the school to the time they leave, there is not a happy moment for teacher or children. And the farce is termed 'The Annual Examination in Religious Knowledge.'

The N.U.T. Examinations Board. The Executive of the N.U.T. has decided to hold certain examinations, invitations to do so having reached the office from various quarters. As a matter of fact, two or three examinations have already been successfully carried through. I believe this will become a very popular branch of the Union's work, and certainly, from the professional point of view, it is the right thing to do.

When the registration of teachers is an accomplished fact, it will be necessary, I imagine, to have an examining and certificating body which will not be the Education Department.

The Union must see that it is fairly represented on this Board. As paving the way for other and perhaps more important work in the future, the Executive has begun with the examination of pupil teachers, a serious business with the present pressure on the office, if, as I believe will be the case, the demand for the assistance of the new Examinations Board is an extensive one. The number of examiners is a large one, and all are thoroughly well qualified for the work they have been asked to take in hand. Mr. A. A. Thomas, B.A., is the

hon. sec., an excellent choice in every way. At the Executive he has done, and continues to do, very useful work, and not in one direction only. He is a Cheltenham trained man, and

MR. A. A. THOMAS, B.A.

Bachelor of Arts (Honours in Jurisprudence, Political Economy, and Civil and Constitutional History, R.U.I). He is a member of the Finsbury Council, Treasurer of the London Assistants' Committee from the first, President of the National Federation of Assistant Teachers, member of the M.B.T.A. Committee, member of Executive of the London Young Wales Society, and, with Mr. Cyrus Heller, B.A., he examined for the Watts Charity Trust (Rochester)—the first examination conducted by the Union. In him the class teachers have an able champion, one who is determined his brethren shall occupy the position which is rightly theirs, zealous and painstaking in all he undertakes, keen in debate, honest and courteous not only to those who vote with him, but also to his opponents. It needs no prophet to say that Mr. Thomas, if blessed with health and strength, will go on from success to success.

The Teachers' Orphanage and Orphan Fund. Last month I referred to the good work which is being done by the Teachers' Benevolent Fund. On this occasion I should like to say a few words concerning the Orphan and Orphanage Fund, of which Mr. C. J. Addiscott, Vice-President N.U.T., is the Chairman, Mr. C. Bennett (Sheffield), the Vice-Chairman, and Mr. J. H. Devonshire (the father of the Orphanages), the Treasurer. I might also add perhaps, that the Patron and Patroness are respectively the Duke and Duchess of York, and the President, Sir William Hart Dyke, M.P. Figures are more eloquent than pages of reading matter, so I give those for 1895: Subscriptions and donations £1,308, Orphan Day contributions £85, by entertainments £282, by Conference scheme £6,047, by dividends £388, other receipts £36, total £8,146. And now for the Expenditure side: Investments £4,450, home allowances £1,389, special grants £272, orphanage charges £1,869. Our Orphanages at Page Hall, Sheffield (girls), and at Peckham (boys), are flourishing; the children are well fed, well cared for, well taught. I have had the privilege of seeing the girls in the old home at Firs Hill, and the boys at the Peckham institution. Both are 'homes' in the best sense of the word, and at every visit I have been delighted to see the happy faces and the air of comfort with which we were surrounded. And then, not only do we care for the little ones in these 'homes.' By means of 'home allowances' (5s. a week) we are able to do something for others for whom there is no room in the orphanages, or whose relatives prefer to keep them at home. Special grants, too, are made in all deserving cases. The number of children assisted by the fund, in one way or another, last year was 256, the highest on record. I need not point out to my readers the good work which this fund is doing, how the widow's tears are dried, and the fatherless child saved from want. Can I appeal for subscriptions? Every shilling helps. If any reader cares to send to me, I will see that the amount is handed over to the Secretary, and that a receipt is sent. Teachers! Help the little ones!

Tenure at Hanley. Mr. F. B. Gill, the able head master of the Hanley Higher Grade Board School, has recently experienced the sort of treatment which one sometimes expects to see associated with the doings of an ignorant small school board, but never with a body of men such as that elected to carry on the educational work of Hanley. The results obtained during the time Mr. Gill has presided over the Higher Grade School have been nothing short of marvellous, but this success counts for nothing with the good men who are the 'masters of the situation.' There are rumours that the whole trouble arises from the fact that Mr. Gill's political convictions run counter to those of the majority of the Board, and that his religious convictions are somewhat different from those of the said majority. If these are not the reasons for the Board's action, let the real reason be given. Mr. Gill has asked to be allowed to meet the Board, but no! the 'matter was closed!' The parents, however, like the good Cornishmen of old, demand 'the reason why.' I was delighted to see from the *Staffordshire Sentinel* of October 9th—a copy of which was sent to me by a reader of the 'PRACTICAL TEACHER' in the district—that the parents are with Mr. Gill and against the Board, that they have asked for a reconsideration of the case, and that they have expressed their confidence in the head master. Mr. Gill is an old colleague of mine, and I know that his abilities and zeal deserve a better recognition than they have met with at the hands of the Hanley School Board. However, there is yet time for wiser counsels to prevail.

The St. Albans Association, N.U.T. The St. Albans Association, though numerically not one of the most important, is certainly one of the most active in the country.

MR. JOHN ROE.

This, I believe, is mainly due to the zeal, the energy, and the ability of its hon. sec., Mr. John Roe, whom, by the way, I congratulate on his recent election to a Fellowship of the

Educational Institute of Scotland. Much credit is also due to the President, Mr. D. J. Tarran, whose 'Chairman's Notes' are a feature of every meeting, and a very interesting and en-

REV. G. H. P. GLOSSOP, M.A.

joyable feature, too. On the 10th October the Association was invited to Romeland House, the residence of the Rev. G. H. P. Glossop, M.A. (the Chairman of the St. Albans School Board), who placed dining-room, drawing-room, study, etc., at the disposal of the visitors, whom he entertained right royally! Nor is this the first occasion upon which he has dispensed his hospitality to the local branch of the N.U.T. On the last occasion he arranged for a lecture by Dr. McNaught, who showed what might be done in the course of a music lesson with a class of children. On the 10th October, the date to which I am now more particularly referring, the subject was 'Further Notes on Sweden' (Part I. having been given earlier in the year), and it was my privilege to be the lecturer and one of the invited guests. That being so, I cannot well say all that might be said, but there can be, perhaps, no objection to my congratulating the members of the Association upon having in their midst so generous a friend, and one who is so appreciative of the teacher's work as Mr. Glossop. Nor would this note be complete without a reference to the arrangements made by Mrs. Glossop, who took care that nothing was overlooked which could in any way minister to the comfort and enjoyment of those who were present. Among others who had accepted the invitation of the Chairman of the Board, I noticed E. N. Wix, Esq., H.M. Inspector for the district.

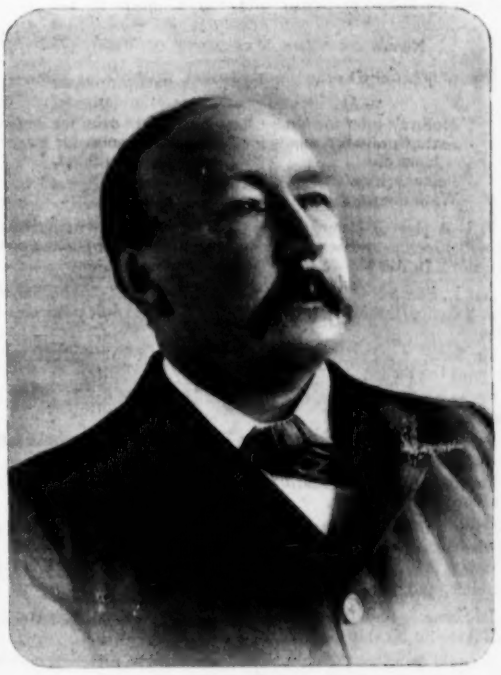
The Late Archbishop of Canterbury. 'How terribly sudden' was the natural exclamation of most of us as we read the details of the death of good Archbishop Benson at Hawarden Rectory. How strange, too, that when the end came he was with his old friend and patron, the ex-premier! 'He died as a soldier,' said Mr. Gladstone when the sad news was communicated to him. If for no other reason, the fact that he was an old school master, having been for some years assistant master at Rugby, and later, head master of Wellington College, justifies a reference to the late Primate in these columns. With the report of the Archbishops' Committee as to further financial aid to Voluntary Schools we are all familiar. The constitution of that Committee, however, was a serious mistake, no teacher being asked to serve upon it. With the teacher expert in their midst the members would have avoided some at least of the errors which invited criticism immediately the Report was published. It is well known that his Grace was looking forward hopefully to the great Conference of Churchmen in London in November, when an effort will be made to come to some understanding as to Rate Aid or State Aid.

Mr. Diggle's somewhat jocular reference to the Primate at the recent meeting of Voluntary School teachers would not have been made, I suspect, if the speaker had known that the end was so near. Said Mr. Diggle, referring to the rate aid question :—It was not a pleasant thing to see the Archbishop of Canterbury in the white sheet of penitence in the columns of *The Times*, but he (Mr. Diggle) would rather see him there, and the Bishop of London standing by his side, than know that they were still in an unrepentant frame of mind. It took a great deal to convert a bishop and an archbishop at his back. Now the Primate is no more, and Mr. Diggle's criticisms and the question of Rate Aid and State Aid will trouble him no longer.

By the death of the Archbishop the Queen loses the fifth holder of the office during her long reign. When she came to the throne Archbishop Howley occupied the See, and afterwards followed Sumner, Longley, and Tait.

The touching telegram of condolence from Balmoral to Mrs. Benson must bring this note to a close :—'I am stunned by the awful news. My heart bleeds for you, but my own sorrow is great, for I was so fond of the dear, kind, excellent Archbishop. A terrible loss to all. My dear daughter joins me in my expression of sympathy to you.—V.R.'

Mr. J. G. Kerr, M.A., Past President E.I.S. The comment of every English teacher who knows Mr. Kerr, and there are hundreds of them, upon the recent election of Secretary of the Educational Institute of Scotland, is 'what a splendid man the successful candidate must be, if he is superior to Mr. Kerr.' Here, in the south, we imagined, in our innocence, that it was a foregone conclusion, and that Mr. Kerr's election was certain. I trust that the E.I.S. will continue to have the benefit of the ripe experience of the gentleman who has done so much for the Institute and the cause of



MR. J. G. KERR, M.A.

education and the teacher. In a former note I referred to his services in the Superannuation field. No man has given more time or thought to this question than he has. Early and late

he has worked at it, he has spoken upon many platforms demanding this measure of reform, as much in the interests of the children as of the teachers themselves; he has written frequently on the subject, and in every way possible he has devoted himself to the cause with an energy, an ability, and a self-sacrifice which should endear him to every teacher in Scotland. I have just heard that the General Committee of the E.I.S. has placed him at the top of the Special Committee list, he is, of course, again Convener of the Superannuation Committee, and also of the Committee on School Libraries, so that it appears he is neither out of work, nor, in in spite of the recent contest, out of patience. Trained as a pupil teacher in Dumbarton, under Dr. Dickie, now of Kilmarnock Academy, Mr. Kerr proceeded to Glasgow, where his brilliant career as a student secured for him an appointment to a Snell Exhibition at Balliol College. On leaving Oxford he became an assistant master in Kilmarnock, whence he was transferred, after a year's service, to Glasgow E. C. Training College, and there, as Mathematical Lecturer for thirteen years, was intimately associated with the training of teachers. In 1890 he was invited by the Governors of the Glasgow and West of Scotland Technical College to undertake the Head Mastership of Allan Glen's School. And there he is to-day doing excellent work and winning golden opinions. May health and prosperity be yours, Mr. Kerr, for many years to come.

OUR 1897 CERTIFICATE CLASS.

BY J. C. HOROBIN, M.A.,
Principal, Cavendish College, Cambridge.

The Examination for Certificates will commence on Monday, 12th July 1897, at 2 p.m.

The general conditions for candidates are to be found in Articles 55–64 and 116–121 of the current Code.

NOTES ON 'THE MERCHANT OF VENICE.'

The play belongs to the Second Period, that of King John.

John.	*Venice.*
Mother's grief for son.	Father's grief for daughter.
Arthur prays for mercy for himself.	Portia prays for mercy for the Merchant.
Falconbridge.	Gratiano.
Wash disaster.	Antonio's ships.

It is a play of strong contrasts:—gravity—levity; gentleness—ferocity; mercy—vengeance; friendship—love; love—hate; passion and storm in Act IV.—moonlight peace in V.

Act I., Scene 1.—In the conversation between Antonio, Salarino, and Salanio, the keynote of the play is struck—SAD in the first line.

In Scene 2., Portia's 'little body awearv of this great world' deepens the theme.

Scene 3. depicts the cruel Jew writhing under racial insult and trade spite.

Act II., Scene 1, introduces the Prince of Morocco whose failure is described in Scene 7.

In Scene 2 is the wonderful psychological study of Launcelot and his fooling with Gobbo.

Scene 3 introduces Jessica, and gives the parting between her and Launcelot.

Scenes 4–6 deal with the masque, the elopement of Jessica with Lorenzo, and the departure of Bassanio.

In Scene 8, Shylock discovers the loss of ducats and daughter, and Antonio his ships.

Scene 9 describes the election of the Prince of Arragon, and foreshadows the rising fortunes of Bassanio.

In Act III., Scene 1, Shylock curses Jessica and prepares his plan of action against Antonio with Jabal.

Scene 2 is the centre of the play, the keystone being set in the arch by Bassanio's choice of the leaden casket.

Scenes 3 and 4 show Antonio in custody, and Portia's departure for Venice.

Scene 5 is a comic scene, which by contrast heightens the dramatic effect of the trial.

Act IV., Scene 1, is the famous trial scene with the traditional solution of the bond added to by Shakespeare's legal solution in bringing in the old statute law of Venice against aliens.

Scene 2 shows the artfulness of Nerissa in obtaining Gratiano's ring.

Act V., Scene 1, opens with the beautiful moonlight scene between Lorenzo and Jessica, followed by the discourse on music, and the meeting of Portia and Bassanio, and the news of Antonio's safely arrived argosies.

Dowden says:—'No person depicted in any preceding comedy can compare in vigour of drawing and depth of colour with Shylock, and Portia is the first of Shakespeare's women who unites in beautiful proportion, intellectual power, high and refined, with unrestrained ardour of heart.'

Hazlett says:—'In proportion as Shylock has ceased to be a popular bugbear, he becomes a half favourite with the philosophical part of the audience, who are disposed to think Jewish revenge is at least as good as Christian injuries.'

'He is,' says Gervinus, 'meanly careful, cautiously circumspect, and systematically quiet, ever shufflingly occupied as a genuine son of his race, not disdaining the most contemptible means, nor the most contemptible object.'

Ulrici says:—'Shylock is a most successful portrait of the Jewish national character generally, not indeed of the noble and high-minded but exclusive spirit which in the time of Moses and David animated the people, but of the low and unworthy sentiments into which this degenerate and fallen nation had gradually sunk during the thousand years of persecution and oppression which marked its dispersion over the face of the earth.'

Mrs. Jameson says:—'Besides the dignity, the sweetness and tenderness which should distinguish her sex generally, Portia is individualised, by qualities peculiar to herself, by her high mental powers, her enthusiasm of temperament, her decision of purpose, and her buoyancy of spirit.'

Gervinus says:—'She is musical and energetic, playful and serious, cheerful and devout, quick in judgment, and firm in her demeanour.'

Dowden says:—'Portia is distinguished by the union in her nature of high intellectual powers and decision of will, with a heart full of ardour and of susceptibility to romantic feelings.'

Hazlitt says:—'Portia has a certain degree of affectation and pedantry about her, which is very unusual in Shakespeare's women.'

Antonio takes a passive rather than an active part in the drama. He is rich, yet melancholy; generous, but apathetic; careless and incautious.'

Charles Knight says of Bassanio:—'Though somewhat inconsiderate, is generous and sensible, the true Italian gentleman in the best sense of the word.'

Mrs. Jameson says:—'Nerissa is a clever, confidential waiting woman, who has caught a little of her lady's elegance and romance. Nerissa and the gay, talkative Gratiano are as well matched as the incomparable Portia and her magnificent and captivating lover.'

Knight describes Jessica as:—'A child of nature lost in an oriental love enthusiasm.'

NOTES ON THE QUESTIONS.

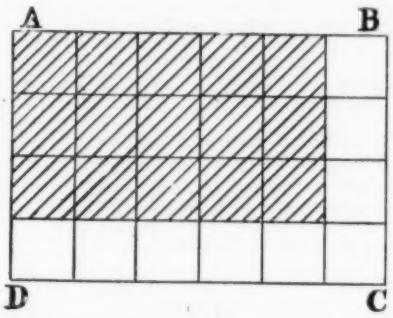
Penmanship.

(*a*) Joining of *s* and *p* should be noted.
(*b*) The parallelism of the strokes in 'tyranny,' which can be written without joinings.

School Management.

1. Note carefully the limits of age. The Examiner evidently designed the question to test the student's use of psychological knowledge. Under seven, arithmetic is mainly concrete, having for objective aim, accuracy and preciseness of recognition, and subjectively, orderliness, and definite apprehension of simple laws. Above seven, arithmetic becomes more abstract, and develops logical statement and accurate reasoning. Hence, more time ought to be devoted above seven than below.

2. (*a*) The simplest apparatus is the number box, which is a sort of cabinet, the vertical columns being marked as in ordinary notation.
(*b*)



If ABCD represent unity, the diagram explains itself.
(3) See Fitch, 195–200.

Composition.

The two leading words should be clearly defined by the writer, and the definition stuck to throughout, or the essay will be involved and of little value. Co-ordination is the head teacher's work solely, and is the best test of his or her skill.

Co-operation presupposes good feeling among the staff, just discipline with scholars.

Arithmetic.

1. $\frac{374}{561}$, $\frac{272}{408}$, $\frac{391}{543}$, $\frac{322}{483}$.
2. £1.
3. Simple bookwork; ·428571; ·4, ·45; ·461538; Sum is $1\frac{789099}{}$.

Music.

Remember intervals are named by the number of notes including the terminals and usually upward.

English.

1. The 's represents the O.E. genitive suffix es, hence the ' shows the dropping of the e.

The subjunctive states a supposition, inference, will or desire (Greek optative).

2. The analysis is straightforward.

Asserting is a verbal noun, objective case.

what must be considered a compound relative including its own antecedent.

3. The metre is strictly trochaic, with the accent on the first syllable of each foot, with an extra hypermetrical syllable in each line.

It is noteworthy that the reading of the lines would require a different form of scansion. Thus the accent is strictly on 'In' and 'O,' but most readers would make these short.

Geography.

Both questions can be answered from the books recommended.

N.B.—Messrs. Gill have now brought out a special Geography for Africa, which will be found useful.

History.

1. (*a*) King more mysterious and sacred.
(*b*) Old nobility of blood superseded by new nobility of King's servants (courtiers).
(*c*) Decline of freeman, the ceorl becoming a villein.
(*d*) Witan gradually limited to great officers of Church and State and the King's thegns.
(*e*) Decline of slavery.
2. Stock—dealt with in any history.

Domestic Economy.

1. Nelson's 'Domestic Economy,' 105.
2. ,, ,, ,, 63–84.

Geometry.

1. The rider is a simple case of I. 4.
2. The placing of one geometrical magnitude on another, such as a line on a line, a triangle on a triangle, etc., is called superposition. It is purely a mental operation. Axiom VIII. is required and a principle not explicitly stated by Euclid, viz.—

Any figure may be tranferred from one position to another without change of form or size.

SECOND YEAR.

School Management.

1. Page 119, 'N.U.T. edition of Code.'
,, 123 ,, ,,
2. Pages 38–40, Fitch's 'Lectures.'
3. Because the order of development seems to be discrimination, assimilation, retentiveness. In other words, the senses are used to distinguish and compare objects, the results are compared and described symbolically (words), and these used for marks of previous states in subsequent operations.

Algebra.

1. E. $= \dfrac{\sqrt{12+24}-\sqrt{16+9}}{\sqrt{144-44}-\sqrt{42+24-2}} = \frac{1}{2}$.
2. $4x^5-9x^3y^2-10x^2y^3+xy^4-20y^5$.

Music.

See First Year and 'School Music Teacher' (Dr. McNaught), pages 10 and 253.

English.

All straightforward.

Domestic Economy.

1. Easy and dealt with in all manuals, but there are two matters that always ought to be specially noted.
(*a*) The drinks should be quite fresh.
(*b*) The broth is improved as a food stuff by having a bunch of fresh vegetables in a muslin bag stewed with the meat.
2. Gold coins are standard; silver and copper, 'token' money, that is their real value is less than their nominal value. Paper money occurs mainly as banknotes, cheques, and bills of exchange.
Transference can be done by:—
(*a*) Bullion or coin (if registered).
(*b*) Postal Orders.
(*c*) Post Office Orders.
(*d*) Cheques.
(*e*) Banknotes.

MEN ONLY—FIRST YEAR.

Algebra.

1. Bookwork dealt with in any Algebra.
2. Let $x-y=\frac{p}{q}$;

then $(x+y)(x-y)=\frac{p}{q}(x+y)$,

or $q(x^2-y^2)=p(x+y)$.

3. (*a*) $\dfrac{x^2-7^2}{7(x+7)}+1=\dfrac{2x-9}{5}$

or $\dfrac{x-y}{7}+1=\dfrac{2x-9}{5}$, whence $x=7$.

(*b*) $x^2+ab=x^2+bx+ax$,

or $x=\dfrac{ab}{a+b}$.

Geometry.

1. Using the usual letters,
AD = AE.
$\therefore$ $\angle$ AED = $\angle$ ADE.
Similarly $\angle$ FDE = $\angle$ FED.
The two triangles ADF, AEF fulfil LIV.
$\therefore$ $\angle$ DAF = $\angle$ EAF.

2. Let A, B, C, be the three given points. Join AB, BC. Bisect AB at D, and erect DF perpendicular to AB.
Bisect BC at E and erect perpendicular.
F is required point.

SECOND YEAR.

Algebra.

3. Divide as usual, or remembering—
$x^3+y^3-z^3+3xyz \equiv (x+y-z)(x^2+y^2+z^2-xy+xz+yz)$,
the quotient can be written down, viz.—

$$1+\frac{1}{a^2}+\frac{1}{b^2}-\frac{1}{a}+\frac{1}{b}+\frac{1}{ab}.$$

Log. 25 = log. 100 − log. 2^2
= 2 − 2 log. 2.

The fifth root is given by—

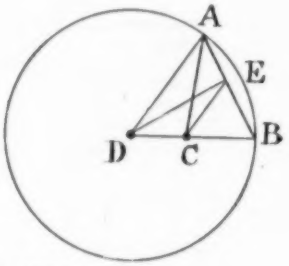
$\frac{1}{5}[2 - 2 \log. 2 - 3]$.

or $\frac{-2 \log. 2 - 1}{5}$, and since $.03125 = \frac{1}{32} = \frac{1}{2^5}$,

$\log. .03125 = -5 \log. 2$.

Geometry.

3. Let AB be the chord subtending a right angle at C. Let D be the centre of the circle. Join AD, BC, and draw DE perpendicular to AB.



Then AE = EB (III. 3),

$\therefore$ AE = EB = CE.

(AEB is right angled, and CE is equal to AE or EB (I. 12), etc.

Also $AD^2 = AE^2 + ED^2$

$= ED^2 + EC^2$;

but AD is fixed and given, being the radius of the circle,

$\therefore$ $ED^2 + EC^2$ is given,

and the base DC is given.

$\therefore$ the locus of E is a circle by a simple rider on II. 10.

SYLLABUS OF WORK FOR THE MONTH.

Students are advised not only to get up the work indicated, but to use the test questions also as indications of work to be got up and afterwards written out.

FIRST YEAR.

School Management.

1. School furniture, especially height, slope, and position drill in desks.
2. Place of Science (including object lessons) in the curriculum.
3. Discipline—aims—means.
4. English—order of procedure—composition.

Composition.

1. The licence with history which Shakespeare allows himself in the 'Merchant of Venice.'
2. A crowd is not company.
3. A doubtful throne is ice on summer seas.
4. The earth hath bubbles as the water has.

Arithmetic.

Not less than six examples from miscellaneous sets ought to be worked per week, as well as those on the particular work set and the examination questions given.

1. Pars. 112, 113*, 118 (note method), 119, P.
   Mensuration of triangle.
2. Pars. 128, 132, 136, 138 note, P.
   Same.
3. Pars. 146, 149, 152, P.
   Metric System.
4. Pars. 158, 162, 163.
   Same.

Music.

1. Division I., and suitable exercises thereon.
2. Division II., etc.
3. The special effects of *fah* and *lah*. Environment as a factor in mental effects.
4. Revise 1–3.

English.

1. History of the personal pronouns.
2. Same of the interrogative and relative pronouns.
3. Varieties of Iambics with examples.
4. Revise case, number, and rules of punctuation.

1. Demeter and Persephone.
2. Sir Roger's household.
3. Lady of Shalott.
4. Sir Roger's guest.

Geography.

1. The lake systems of Africa.
2. Chronology of exploration of Africa.
3. Nile, Congo, Zambesi (with sketch map).
4. Communication *with* Africa (steamers, etc.).

History.

1. Constitutions of Clarendon and the life of Becket.
2. War with France, 1793–1802, with lives of Bonaparte and Nelson.
3. The Great Charter and lives of Anselm and Roger Bacon.
4. Pitt, Wesley, the Pelhams, Young Pretender.

1. Inventions and discoveries in James I. reign.
2. State of Society, etc., in the reign.
3. Petition of Right and Remonstrance.
4. Prynne, Strafford, Buckingham.

MEN ONLY.

Algebra.

1. Proof of rule for H.C.F. and L.C.M.
   Harmonic Progression.
2. Revise all definitions up to equations.
   Difference between an identity and equation.
   Harmonic Progression.
3. Simultaneous equations and methods of solution.
   Revise H.C.F.
   Geometric Progression.
2. Proof that a simple equation can only have one root.
   Geometric Progression.

Geometry.

1. Props. XIX.–XXI., Book I.
   ,, IX. Book II.
2. ,, XXIV.–XXVI., Book I.
   ,, X., Book II.
3. ,, XXIV.–XXVI., Book I.
   Revise I.–IV., Book II.
4. ,, XXVII.–XXXI., Book I.
   Revise V.–X., Book II.

N.B.—As many riders as possible should be worked.

WOMEN ONLY.

Needlework.

Practise all stitches for infant's shirt.
Diagrams for the same.

Domestic Economy.

Par. 107–119, Nelson's 'Domestic Economy.'
Sources and Materials of Clothing, or
1. Euclid Props. 5–10, Book I., and Revise Definitions.

SECOND YEAR.

School Management.

1. Fitch, Lecture III. (To school diaries.)
   Summary Register.
   Gifts 1–6 and their psychological basis.
2. Remainder of Lecture III. (Fitch).
   Revise Attendance Register Rules.
   Object lessons, their *raison d'etre* and suitability.
3. Same as (1), Fitch.
   Log Book.
   Connotation and Denotation.
4. Same as (2), Fitch.
   Revise Summary Register.
   Logical character of terms.

Composition.

As First Year.

Music.

1. Musical terms.
2. Leaning tones and the D, S, and F chords.
3. Musical terms.
4. Table of difficult intervals, and methods of practice to overcome.

English.

Macbeth:—
Act I., Sc. 6–7.
Interpretation of lines 2–4, especially *surcease*.
Sc. 7, line 28—Accent of Purveyor, VI. 22.
Learn I. 7. 1–28.
Revise Act I., Sc. 1 and 2.

Merchant of Venice :—
1. Clarendon Press introduction.
2. Act II., Sc. 1–4.
Nerissa.
3. Act II., Sc. 5–9.
Antonio.
4. Revise Introduction.

Tennyson :—
1. 'Coming,' lines 1–171.
2. General Introduction.
3. 'Coming,' lines 172–308.
4. Revise General Introduction.

Arithmetic.
Geography.
History.
} As First Year.

MEN ONLY.

Algebra.

As First Year.
Also 1. Compound Interest.
2. ,, ,,
3. Annuities.
4. ,,

Geometry.

As First Year.
Also 1. Book III. 20, 21.
Revise Definitions Book V.
2. Book III. 22.
,, VI. Definitions.
3. Book III. 23, 24.
,, VI. 1.
4. Book III. 26, 27.
,, VI. 2.

WOMEN ONLY.

Needlework.

Diagrams and stitches for muslin pinafore.

Domestic Economy.

As First Year.
Also Pars. 161–176.

QUESTIONS FOR TESTS.

FIRST YEAR.

1. Write in large, text, and small hand:—
Little strokes fell great oaks.

2. Dictation :—
The historical literature | of England | has indeed suffered grievously | from a circumstance | which has not a little | contributed to her prosperity. | The change, great as it is, | which her polity | has undergone | during the last six centuries, | has been the effect | of gradual development, | not of demolition | and reconstruction. | The present constitution | of our country is, | to the constitution | under which she flourished | five hundred years ago, | what the tree | is to the sapling, | what the man is to the boy. | A polity thus formed | must abound in anomalies. | But for the evils arising | from mere anomalies | we have ample compensation. | Other societies possess | written constitutions | more symmetrical. | But no other society | has yet succeeded | in uniting revolution | with prescription, | progress with stability, | the energy of youth | with the majesty | of immemorial antiquity.

School Management.

1. Describe the best desks for (*a*) Infants, (*b*) older children. How would you place the desks with regard to light? (G.)

2. What do you understand by discipline? What factors are beyond the class teacher's control? (G.)

3. Comment fully on the statement :—
'No school is properly equipped which has not apparatus for simple science lessons.'

Composition.

Write an essay on the Queen's reign.

Arithmetic.

1. Find the Simple Interest on £5,723 8s. 9d. for 5⅝ yrs. at 3½ per cent. per annum; and reduce the answer to farthings.

2. Simplify $2{\cdot}09 \times 1{\cdot}13\dot{5} \times 1{\cdot}3\dot{7}\dot{6} \times 2{\cdot}0\dot{7}692\dot{3} \times 1{\cdot}\dot{5}71428$.

3. A cubical box is covered by £3 worth of penny stamps, each of which is 24 millimetres long by 20 mm. wide. What is the length of an edge?

Music.

1. What do the following terms mean?—
Molto, Sempre, Sostenuto, Tempo Primo, Con Moto, Con Brio.

2. Write a passage of not less than 20 notes for Div. II., introducing the tones of the doh chord.

English.

1. How are differences of gender marked? and what do you know of the history of the inflections of the personal pronoun?

2. Analyse and parse the words indicated :—
Sir Roger, page 17, lines 5–9.
be, that, were, as far as.
Shalott—Last stanza.
this, near, knights, space.

3. Comment on :—
(*a*) Economy, rated, cardinal, spare a large fine, Jack, Mayfly, tenement, manumission, Letting dog, drew.
(*b*) Saw thee, king of shadows, race, shrilly, thridded, Bright one, Earth mother, nectar, steam, The stone, the wheel, river, many tower'd, Galaxy, baldric, Salthemdoun.

Geography.

1. Draw a map of Africa, showing the lakes and the course of the Nile, Congo, and Zambesi.

2. Comment on the following statement, with precise illustrations:—
'The progress of discovery in Africa naturally divides itself into two epochs of five hundred and fifty years.'

History.

1. Write short biographies of Bonaparte, Pitt, Becket, Strafford.

2. What were the provisions of :—
(*a*) Magna Charta.
(*b*) Petition of Right.

MEN ONLY.

Algebra.

1. Prove the rule for finding the H.C.F.
Find H.C.F. of $x^3 + 11x + 12$ and $x^3 + 11x - 54$.

2. Prove that a simple equation can only have one root.
(*a*) Solve $bcx^2 = (b - c)^2(ax + a^2)$.
(*b*) Solve $(x + 1)(y + 1) = 60$.
$xy = 45$.

3. The square of the sum of any two numbers + the sq. of their difference = twice the sum of the squares.
The sum of the cubes of three even numbers in A.P. is divisible by 24.

Geometry.

1. Prove I. 26.
The internal bisectors of the angles of a triangle are concurrent.

2. Prove II. 4.
The square on a line is equal to four times the square on its half.

WOMEN ONLY.

Needlework.

1. Cut out and make up an infant's shirt.

2. On a piece of calico show not less than two inches of all the stitches required.

Domestic Economy.

1. What do you know about the teeth?

OR,

1. Prove I. 8.
If two adjacent sides of a quadrilateral are equal, and the diagonal bisects the angle between them, their other sides are equal.

SECOND YEAR.

Penmanship.
Dictation.
Composition.
Geography.
History.
Arithmetic.
Alternative Geometry.
} As First Year.

School Management.

1. (*a*) What do you mean by the *closing* of a Class Register for a morning or afternoon sitting? What acts of carelessness or irregularity on the part of teachers and scholars should be guarded against on these occasions?

(*b*) What facts should be recorded in the Admission Register, and in what circumstance may a name be removed from it, or be inserted in it a second time?

(*c*) (i) What exceptions are admitted to the general regulation that in order to receive a grant a public elementary school must be open at least 400 times in the year?

(ii) Describe a scheme of Attendance Prizes.

(iii) How would you calculate the attendance for a Government Examination held at (1) an interval of seven months from the last inspection ; (2) at an interval of 15 months ?

2. What do you understand by connotation or intension ? Give examples.

3. What tests does Fitch give of a good school book ?

Music.

Same as First Year.
Also, what do the following names show ?—
re, le, la, fe, ra, se.

English.

1. Write short descriptions of Lady Macbeth, Portia, Shylock, Antonio.

2. Analyse 'Merchant of Venice,' Act II., Sc. 7, lines 65–73 ; and parse—that, that, But, as wise as.

MEN ONLY.

Algebra.

As First Year,
Also (1) Prove $\log_a c = \log_a b \times \log_b c$.

(2) In how many years will a sum of money double itself at 4 % ? $\log 26 = 1{\cdot}41497$.

Geometry.

As First Year.
Also Prove III. 22, 27.

If a figure of six sides be inscribed in a circle, the sum of any three alternate angles is four right angles.

WOMEN ONLY.

Needlework.

Cut out and make up a pinafore for a child of about six.

Domestic Economy.

As First Year.
Also—Give three ways of cooking eggs.

OUR SCOTCH LETTER.

The Approaching School Board Elections. The issue by the Scotch Education Department of regulations with regard to the triennial election of School Boards, and the duties and remuneration of the officers required in the elections, reminds us of the approach of the periodical change in our masters. It is a great weakness in the School Board system that all the members retire at the end of every three years. If only a third of the members—as nearly as possible—were to retire at one time, we should have a better guarantee of continuity in policy. A still greater improvement would be the extension of School Board areas and the abolition of the five member Boards. No doubt this change will ere long be brought about, and teachers are agreed that it cannot take place too soon. It would certainly do much to put an end to the cases of arbitrary dismissal, of which there have unfortunately been too many recently.

Queen's Students. The Scotch Education Department having sanctioned the recognition of Queen's Students at the Universities, the St. Andrew's Committee, chosen to superintend the training of teachers, have elected for the session just begun fifteen male students to bursaries of £25 per annum for two years, and fifteen female students to bursaries of £20 for two years. The students must pass the University Preliminary Examination, or must have passed an equivalent examination, such as that of the Leaving Certificate, or they must have obtained a place in the First or Second Class in the Queen's Scholarship and Studentship Examination. As Principal Donaldson remarks, this may be a new era in the educational profession, and may lead to that profession being recognised as one for which University training is requisite. We observe also that Aberdeen University begins the session with four Men Queen's Students.

The E.I.S. and the "Educational News" Company. It has been felt for some time that the Institute should have some say in the management of the *Educational News*, in virtue of its holding shares in the company. The directors, being anxious to meet as far as possible the desire of the Institute to be represented on the directorate, have agreed that the Institute shares shall in future be placed in the name of the president, each president, as he retires, transferring the shares to his successor. The acting president will thus obtain the qualification necessary, and will accordingly be placed on the directorate during his year of office.

E.I.S. Representatives in Schools. In these days when the local branches of the Educational Institute are vieing with each other in the matter of increasing their membership, we would direct the attention of secretaries and others to a plan which has been found to work well where it has been tried. In each school or district a representative has been appointed whose duty it is to try to get all his (or her) colleagues to become members of the Institute, to intimate changes of teachers to the local secretary, to distribute notices of meetings, and generally to look after the interests of the Institute. In large branches such an arrangement affords considerable relief to the local secretary, while, as we have said, it has been found effective in bringing teachers—many of whom were only waiting to be invited—into the professional fold.

Next Annual Meeting of the E.I.S. Comparatively few members, we venture to think, are aware that it was resolved at the recent annual meeting of the Educational Institute to have in future a sederunt on the evening of the Friday preceding the Annual Meeting day. At this evening meeting the retiring president will deliver his address, and the Saturday's proceedings will thereby be somewhat shortened. As this new departure will clash with the social gatherings of the Training College Clubs, it was expected that there would be opposition to the proposal. No objection having been taken to the recommendation of the General Committee, however, it will come into operation in September next, with what result will then be seen.

Incorporated Institute of Scottish Teachers of Agriculture. The Incorporated Institute of Scottish Teachers of Agriculture is becoming quite an important body, and deservedly so. In his closing remarks at the annual general meeting, the chairman made, amongst others, the following suggestions for the improvement of the Association : That certificates granted to schoolmasters attending the summer classes should, as formerly, qualify for earning grants both from the Department and from County Councils ; that the principles of agriculture should be recognised as a class subject in public schools and paid for by County Councils ; that Professor Wallace should be asked to read a paper on this subject at the New Year Congress of the Educational Institute ; and that the Department of Agriculture should be asked to send a copy of its publications to each member of the Institute. These recommendations show that the Association is determined to keep the question of agricultural education well to the front. It is doing admirable work, and we wish its members all success in their endeavours to benefit a sorely-tried class of the community.

Promotion of a Scotchman in India. The numerous Scotch friends of Mr. William Bell, M.A., Principal of the Government College, Lahore, who is at present on leave in this country, will be glad to learn that he has been directed to return to India on promotion to the post of Senior Inspector of Schools, Punjab. Mr. Bell went through a regular course of training as pupil teacher and teacher in an elementary school before going to India. They evidently do these things better in our Eastern Empire than in the mother country.

Appointments to the Inspectorate. The Aberdeen Branch of the E.I.S. has adopted the following resolution :—"That in the interests of education this branch overture the General Committee to consider what steps ought to be taken to prevent the appointment as Inspector of Elementary Schools of anyone who has not been engaged in teaching as a fully

qualified teacher in such schools, and to take action accordingly." Representations have from time to time been made to the Department on the lines of the overture, and it was fully understood by teachers that in future only those who had had experience in teaching would be appointed to the Inspectorate. The mover of the resolution points out that H.M. Inspectors are directed by "My Lords" to observe methods of teaching and to give hints and suggestions towards the best methods, and he very pertinently asks how such an instruction can possibly be carried out by anyone who has had no practical experience in teaching. In the face of such an instruction it is utterly absurd that the Department should appoint as an Inspector anyone, however eminent as a scholar, who had not been trained for the office in the only way in which this can be done, namely, by actual service as a teacher.

Child Study. Dr. Paterson, Rector of the Edinburgh F.C. Training College, has been lecturing to the Dundee Branch of the E.I.S. on the new science of "Child-Study." The lecturer showed the intimate relations existing between psychology and education, and pointed out that the only true method of acquiring a knowledge of the science was by the patient study of the living, developing mind of the child. He also explained how the knowledge acquired by the study of psychology should be applied in the regulation of the instruction imparted to the child mind, and in the determination of the kind of educational treatment each should receive so that the infant brain should not be overtaxed. The subject is an interesting one, and, although it has its firmest root in America, associations for its study are being formed in many parts of this country. The Edinburgh Branch of the "British Association for Child-Study" has arranged for a course of lectures on this subject by Dr. G. R. Wilson, of Mavisbank, which promise to prove interesting to teachers.

An Inspector as a Humorist. H.M. Inspectors of Schools do not often appear as (conscious) humorists. The following lines, which are not found in the Blue Book for the current year, are therefore all the more deserving of publication :—

LINES WRITTEN BY A SCOTCH SCHOOL INSPECTOR.

"It *was* the schooner Hesperus,"
So Longfellow doth say ;
It *is* the same perfidious bark
I hear of day by day.

"Week in, week out," is Bruce "flung down
In lonely mood to think"
By Standard III., while Standard I.
Says, "Twinkle, twinkle, twink."

"With gurgling sound" they murmur forth
How sank "the Inchcape Bell ;"
In weary dreams I nightly hear
"Poor Gelert's dying yell."

"The boy stood on the burning deck,"
Is more than I can stand ;
'Tis worse and worse the way they speak
About the "Better Land."

I've met "the little cottage girl"
More times than I can say ;
And far too often, I am sure,
I've "heard of Lucy Gray."

With weary, panting gasps, on high
They drag poor "Daisy Dill ;"
They clip their words, although they try
To say, "Bite bigger, Bill."

"Sweet was the sound at evening's close"
In Auburn long ago ;
'Tis not so sweet when boys repeat
"With careless voice and slow."

They drawl, "in beauty side by side,"
The hackneyed rhymes to me ;
And "were this all, and nought beyond,
O, earth !" 'twould glorious be.

But, if I reach "the happy shore,"
—Of which my hopes are dim—
Confound it ! there I'll meet once more
The eternal "Little Jim."

PROSPECTS OF EDUCATION IN ENGLAND.

AN ARTICLE IN THE 'NORTH AMERICAN REVIEW,' BY THE RT. HON. SIR JOHN E. GORST.

Is it not Wilkins Micawber who says : 'Procrastination is the thief of time. Collar him !'? Like Mr. Diggle, and others who have recently given their views to the world by speech or pen, Sir John Gorst thinks *now* is the 'collaring' moment. It is now or never !

The genial Vice-President of the Council in his latest contribution may not have given us anything very new or original, profound or conclusive, but there can be no doubt as to the usefulness of his paper, and as to the object with which it was written. Sir John sets out with the chief obstacles to the progress of education in England—viz., party spirit and religious intolerance—and he concludes with the statement that if sectarian and religious animosity is to continue it is very improbable that a system of education can be established which will enable the workers of England to compete on fair terms with their foreign rivals. That is the idea all through the paper. The writer is confident the difficulty of further financial aid can be met, but it may be that the 'party' question will bar the way to a settlement.

Sir John's criticisms, admissions, and suggestions will be widely read and widely discussed, and that, no doubt, was in the writer's mind when he sat down to his task. It is certain, too, that his views will be received with respect even by his opponents, while the 'rate-aiders' will rejoice in his conversion to their principles !

There are several smart things in the paper. We may not agree with them, but they are clever all the same. The definition of the religion taught by most School Boards will cause a laugh even among the Nonconformists. 'It is,' says he, 'a new kind of religion established by law and popularly known by the name of "Undenominationalism," and it consists of so much of the doctrines of Christianity as do not conflict with the tenets of any particular Church or sect.'

Later in the paper there is a sly dig at some of his colleagues. 'It is impossible,' says he, 'to refrain from asking whether better education of the people would not tend more to the relief of agricultural depression than remedies like bimetallism or protection.' And then there is his criticism of the Science and Art Department ! Well, our readers must turn to it for themselves.

Sir John lays great stress upon the fact that the struggle in which England is engaged with her foreign competitors threatens not only the supremacy, but even the very existence of her industries. He declares that the English workman is worse instructed than his foreign rival, and for that very reason is 'going to the wall' ; that better education, both elementary and technical, is vital to the continuance of England's prosperity, and that the case is so serious that 'even if adequate technical schools were provided, the mass of the people are unfitted to take full advantage of them.' Sir John does not mince matters. He feels it is time to speak plainly, and very plainly indeed does he speak throughout this interesting paper.

Naturally, the paper falls under two heads :

1. Elementary Education.
2. Education higher than Elementary.

The writer has a good word to say for the Elementary Education Act of 1870. It is 'worked in a most satisfactory manner' in the metropolis, and in the large county boroughs.

Two-fifths of the children of school age are to be found there, and of the remaining three-fifths, the large proportion are in rural parishes, where the Act of 1870 has been much less successful. In the former, 'the members of the Boards have been generally elected from those who are sincerely desirous of promoting good education, and who take a lively

interest in municipal government, and they have established thoroughly efficient schools; in the latter, the general level of education is very far below the city standard,' and the schools 'under the charge of School Boards are generally inferior to those which have voluntary managers.' Sir John is not much in sympathy with one of the resolutions of the Brighton Conference—the famous *ad hoc* resolution. 'Some persons attach extraordinary value to the fact that the members of the School Boards are elected for the express purpose of managing schools. It is doubtful whether any real advantage has been obtained by this arrangement, and whether the same results would not have been attained if the school authority had been a committee of the Municipal Council!'

The next consideration is the two obstacles which hinder the full measure of success being attained. The first is the early age at which children leave school, and the second the fact that the School Board system in boroughs does not cover the ground.

The proportion of children educated in voluntary schools as compared with the number educated in Board schools in boroughs is as three to four, and the serious part of the business is that 'these voluntary schools do not in general possess the means of giving so efficient an education in secular learning as the Board schools.'

Notwithstanding this, however, the writer does not believe that the 'painless extinction' which some zealous people wish for will come to pass—first, because of the cost of supplying their places, and secondly, because of the religious sentiment of a considerable number of the people. 'Undenominational teaching is objected to by a considerable section of the Church of England, by the Roman Catholics, possibly by a few bodies of religious dissenters, and by the Jews. The "Undenominationalists" meet the objectors with religious intolerance. They consider that people ought to be satisfied with their teaching, and, if not, that it should be forced upon them.' Sir John is of opinion that even if the Parliamentary Grant were wholly withdrawn voluntary schools would not be utterly destroyed. He is, however, alive to their deficiencies and their needs. Teachers in those schools, as a rule, he declares, have lower salaries, the assistants have lower qualifications, the proportion of children to teachers is greater, and child labour in the shape of monitors and pupil teachers is more extensively employed. Thus Sir John in a few words lays bare the poverty of many, very many voluntary schools, the indictment being true of probably the majority. As to the salaries, he points out that in boroughs voluntary school managers spend from local sources 10s. per child, Board schools 25s.—13s. of this difference being accounted for by the difference in the amount spent on the teaching staff.

A good case having been made out for further financial aid, Sir John goes on to discuss the pros and cons of Rate Aid and of State Aid. He is not satisfied that the latter will lead to an effective settlement, for it can neither be adequate nor permanent.

It will not be adequate because the Government aid is not likely to exceed 4s. per child (Is that Sir John's opinion to-day, or was the article under review written some months ago?), and that will not do much towards placing the two classes of schools upon an equality. (Besides, as he says, who can say that the cost per child in Board schools will be arrested at the figure of 25s.? 'To attempt to limit by a hard and fast line the cost of elementary education is as absurd as to attempt to limit the cost of a gun or of a war ship.') And it will not be permanent, for an Act of Parliament is no security, even if the House of Lords were powerful enough to withstand its repeal, for if a party were in power opposed to the differential treatment of voluntary schools, what is to prevent the cutting off of supplies in the House of Commons?

The writer goes on to show that

RATE AID WOULD BE BOTH ADEQUATE AND PERMANENT.

Adequate 'because it would be the interest of the party representing the ratepayers to secure full efficiency in secular instruction.' Permanent 'because if arrangements acceptable to local authorities were once in satisfactory working order, Parliament would find it quite impossible to disturb them.'

The two parties concerned would be the managers and the ratepayers, the former providing buildings and management in return for the right 'to give such religious instruction as their particular views demand,' the latter requiring that sound secular education shall be given to the children, and being indifferent, so long as liberty of conscience is secured, to the particular religious instruction afforded. 'If no obstacles were thrown in the way these two parties would inevitably come together and make an agreement.' That may be so, of course, but there are difficulties in the way which cannot be removed by a stroke of the pen, even if the pen be that of the Rt. Hon. Sir John E. Gorst. He sees that there might be difficulties in the way of a free hand being given to Town Councils in this matter, but he goes on: 'Parliament might be willing to prescribe a form of contract which should be allowed to be made between the party representing the ratepayers and the managers of denominational schools as the consideration on which they should receive assistance out of the rates.'

Owing to considerations of space I am not free to examine all the points which Sir John makes in the course of his article. There are some, indeed, which must be passed over altogether, and others to which only slight reference can be made.

The 'intolerable burden' imposed on the ratepayers in certain boroughs is one of these—boroughs in which an abnormal proportion of the inhabitants are poor, in which there are a multitude of children to teach, and a very low rateable value upon which to levy rates.

The remedy in boroughs like West Ham and Gateshead, inhabited by a population which works in London and Newcastle, says the writer, if the schools are to be kept efficient, must be much more Imperial assistance, or failing that, 'the areas must be included for purposes of education in the cities to which they economically belong.'

Turning his attention next to rural districts, Sir John asserts that rural School Boards are costly and inefficient, and have failed to establish schools superior to the voluntary schools around them.

In manufacturing districts the competition with the foreigner is still going on, the Englishman in many cases holding his own, but here in the rural districts, where so much depends upon education, the outlook is far from encouraging.

THE AGRICULTURAL INTEREST IS ALREADY BEATEN,

and the reason is that the peasantry of the countries, such as Normandy, Belgium, Holland, and Denmark, which are supplying us with eggs, poultry, butter, and vegetables, which might be produced in unlimited quantities at home, receive an elementary and technical instruction far superior to that received by the English peasantry. Our landowners dislike 'intellectual development,' the farmers 'scoff at the teachings of science,' 'the labourer's children are turned out of school to scare crows when eleven years old, and often, by the connivance of the school attendance officers, who are under the thumb of the farmers, at a much earlier age.' These children soon forget everything they have learned, including even reading and writing! 'How can these people compete with the French agriculturists, carefully trained in schools and colleges in the art they are to practise?'

But the writer sees that additional aid must be carefully distributed. He holds the view of the National Union of Teachers, that unless this extra grant is 'ear-marked and appropriated to specific purposes' the teachers and the children will not benefit, and the only 'relief' will be in subscriptions and rates!

Voluntary schools in the country are better off than Board schools, and it is 'rather, indeed, the Board schools that require financial assistance to enable the instruction given in them to be levelled up to the same efficiency as that given by their rivals.' There will be no improvement in rural districts, says Sir John, until there is some sort of federation among the voluntary schools, until the areas of school districts are enlarged, and until some real educational authority is substituted for the village Board existing to-day.

'Until such an enlargement takes place there is no possibility of establishing in rural districts any plan for a common training of the young teachers, there is no op-

portunity for the employment of itinerant teachers to go from school to school; and there is no scope for an organising teacher who might improve the character of education throughout a large district.'

The defective character of rural education, Sir John thinks, has been conclusively proved by the failure of the County Councils to persuade the villagers to attend the lectures—which were provided by means of the 'Drink-money'—upon bee-keeping, cottage gardening, poultry-keeping, cookery, and so forth. Before, therefore, the cultivator of the soil can hope to equal his Continental rival in the 'knowledge of his art,' he must receive the preliminary training which an improved elementary education would afford.

EDUCATION HIGHER THAN ELEMENTARY.

The action of the Government in this direction, says Sir John, is ill-designed and ineffective—a criticism which the great majority of those qualified to judge will consider thoroughly just. The three channels through which public money is spent are :—

1. Through the Science and Art Department.
2. Through the operation of the Technical Instruction Acts, the first of which was passed in 1889.
3. Through the Higher Grade Schools.

As to the first, Sir John says the money is given as a payment for results, a method the value of which 'may be doubted'—(many of us go so far as to condemn it root and branch)—and his conclusion is that 'on the whole the distribution of these grants has produced as much evil as good.'

As to the second, he thinks that 'the Technical Instruction Acts might be so extended as to be applicable to all secondary education without any violent disturbance of their existing operation.'

As to the third, Sir John declares that 'the School Boards are in this particular exceeding the functions for which they were originally designed,' but he believes that the public approves of the Higher Grade Schools, and that it would be an unpopular act to attempt to interfere in any way.

In 1894 nearly a million and a half was expended through these three channels, and if all the powers of the various Acts had been made use of, the amount might have been nearly £2,400,000.

But there is a loss incurred through the want of coherence and correlation of which, in the words of the Royal Commission, it is impossible to speak too strongly, the evil growing from day to day instead of being cured, and vested interests being created which must of necessity stand in the way of reform.

There must be, concludes Sir John, a

PARAMOUNT EDUCATION AUTHORITY

in every district through which alone public money should flow. And in his opinion that district should be *the county*.

Both primary and secondary education should be in the hands of this authority; 'first, because these two shade insensibly into one another, and it is impossible to draw a line' . . . 'and, secondly, because the Higher Grade Schools, which are processes of the elementary education system, already occupy the ground.'

As we have said before, the article will command attention. There are many points in it for which teachers—and, indeed, all really interested in education—will thank the Vice-President; and, generally, it will be a valuable aid to the consideration of the whole question when the Government once more attempts to relieve the necessities of poor schools.

FROM THE *Daily News*.

Sir John Gorst, always a bold man, has broken his own record by the appeal which he has just made to public opinion to force the hand of his colleagues, and compel them, however reluctant they may be, to face the duty of educating our people. The audacious article which he has contributed to the *North American Review* for October is a manifesto of the first order of political significance—a significance but thinly disguised by its publication as far away as New York, as if it were merely an essay on the prospects of education in England.

THE BERLIN INTERNATIONAL WOMAN'S CONGRESS.

(FROM OUR SPECIAL CORRESPONDENT.)

THE Woman's International Congress at Berlin, which lasted from September 19th to the 26th, has been an extraordinary success, and the German women themselves are as much surprised at the

FRAU MINNA CAVER.

results as the women of other nations. Frau Lina Morgenstern and Frau Minna Caver are to a large extent responsible for the organisation of the Woman's Congress. Early this year the idea of an International Congress of Women Workers formed itself in the minds of a few Berlin women, they worked untiringly to carry out their plans, and they heartily deserve their success. This year was considered to be particularly favourable to a Woman's Congress on account of the Industrial Exhibition, which attracted many strangers to Berlin. The first reception was held on Saturday night in the great Festival Hall of the Englischer Hof, one of the large central hotels.

There was a great crush, for all the tickets were sold, and many Berlin ladies were bitterly lamenting their inability to procure tickets. Inside there was a truly international gathering of women of all nations. The foreign delegates were provided with badges representing their national colours, which they wore during the whole week. The Englishwomen were presented with white and red badges, which they refused to accept as their national colours, choosing instead the red, white, and blue colours, at which the lady steward cried in despair, 'You are taking the American colours.' However, the Russian women afterwards claimed them as their national colours, so the result was that English, Americans, and Russians wore the same badges. Speeches were delivered, and poems of welcome were read, and afterwards there was a perfect Babel of tongues as the women of various nationalities became acquainted with each other. A charming Armenian woman, with dark eyes and long coal-black curls, attracted considerable attention; she was attired in her native costume, with a white lace veil thrown over her dark hair. She spoke no German, but a group of ladies carried on a conversation with her by means of a native interpreter. Cold refreshments were served with some difficulty, for the Germans must always sit round little tables to eat and drink on all occasions, and as the hall was packed with women it was difficult to make room for the tables. Finally the company secured places at the tables, and were refreshed with patties, creams, jellies, sandwiches, weak tea and rum, and mugs of beer.

The real business began on Sunday morning in the magnificent Festsaal of the Town Hall. A choir of girls sang a song of welcome at the opening, which began :

'Seid froh gegrusst Ihr Alle.'

The question for discussion was the general position of women in the various nations, and Germany, Armenia, Denmark, England, France, Finland, Holland, Italy, Austria, Persia, Spain, and Sweden were represented. The Armenian medical woman from Tiflis gave an interesting account of the Armenian women. Armenia appears to be a woman's paradise, for the men outnumber the women, therefore every woman marries. Civil and social equality exists between the sexes, and many of the social evils of civilisation appear to be unknown. The discussions on Monday morning were on the care of young children, and the Kindergarten. Frau Henrietta Goldschmid, of Leipsic, a beautiful white-haired old lady of 70 years of age, spoke of the international significance of Froebel's work.

Later in the day girls' schools and the position of women teachers were considered. Miss Ey, of Portugal, gave an interesting account of the extraordinary ignorance of the Spanish women which showed that education was at a low level.

Fraulein Miesser, of Berlin, discussed the primary schools in Germany. She complained that women were very rarely employed in the State schools in Germany, and that all the head teachers in all the girls' schools were men, and that the salaries of the women teachers were miserably poor.

Afterwards the Russian girls' schools were discussed, and there the position of the woman teacher appears to be satisfactory. Mademoiselle Dupont, of Paris, who was elegantly attired in purple velvet and silver lace, gave her views on what she called the new pedagogy. She proposes to free children from egotism and jealousy, to preserve their originality, and to cultivate in the schools moral and physical hygiene. She attaches great importance to manual occupations in securing these ends.

Miss Dodd, of Manchester, as delegate for the Teachers' Guild of Great Britain and Ireland, spoke of the position of the woman teacher in England. She showed that women teachers held a higher position to-day, chiefly because they had opportunities of higher culture since the Universities had been open to them. She quoted various figures to show the salaries of mistresses in high schools and primary schools. She showed that more women were engaged in primary school work than men, and she gave a sketch of the work of the Day Training Colleges which are in connection with the

MISS C. I. DODD, LL.A.

Universities. She sketched the career of the first set of women students who entered the Training Department of the Owens College in 1892, half of whom took University degrees at the end of their training course. She also showed that in England it was possible for women to sit on Educational Commissions, and Councils, and School Boards, and that two women had been recently appointed Inspectors of Schools.

The rest of the week was spent in discussing women in the Universities, women in factories and industrial work, sick nursing, temperance, women guardians of the poor, social and moral questions, and women's work in art and literature.

Visits were made to the Exhibition, to Domestic Economy and Gardening Schools. A social meeting was held in the Zoological Gardens, in which tea and music played an important part. A banquet was held in the evening, and speeches were made, songs sung, and toasts drunk.

The final meeting was in the New Theatre, on Sunday morning, the 27th September, when a play—*The Woman's Struggle*—was performed. This play attempted to show the helplessness of girls, and their incapability of making a living, when they have had no special training.

Altogether there were ninety-six addresses delivered during the Congress week, besides various discussions on rational dress, the study of child life, and other subjects. The most extraordinary part was the interest of the large and attentive audiences. Day after day audiences of about 3,000 people sat there for hours, listening to the speeches with the most appreciative interest, and every day were women who had not been able to get tickets begging the officials to admit them. We are accustomed to consider the German woman as lagging behind in the progress of womankind, but she is quite awake, and she realises her position.

COURSE 'B' IN ARITHMETIC.

A COMPLETE SYLLABUS FOR A YEAR, IN MONTHLY SECTIONS, WITH TESTS.

BY B. ELDERKIN,
Model School, Westminster Training College.

For Introductory Notice and First Month see February number of PRACTICAL TEACHER.

STANDARD I.

Syllabus—9th Month.

(*a*) Add and subtract up to 99.
(*b*) Multiply and divide by numbers to 6 times 12.

Test.

1. How many are 25 sheep, 19 sheep, 18 sheep, 23 sheep, and 9 sheep ?
2. If a farmer has 72 sheep in one flock and 47 in another, how many *more* sheep would make the flocks equal ?
3. If there are 17 sheep in 1 fold, how many would there be in 5 folds ?
4. If 81 sheep are divided into 3 equal flocks, how many would each contain ?

STANDARD II.

Syllabus—9th Month.

Four rules in sums up to £10.

Test.

1. Add together £2 4s. 10d., £1 13s. 6½d., 19s. 4d., and £2 0s. 7½d.
2. Take £5 6s. 7½d. from £8 4s. 0½d.
3. How much is 9 times 13s. 7½d. ?
4. Divide £8 13s. 3d. by 9.

STANDARD III.

Syllabus—9th Month.

Simple and Compound Multiplication and Division by 29, 39, 49, etc. Amounts to £99.

Test.

1. Tom has 29 times 56 marbles and Harry 39 times 38 marbles : how many more has Tom than Harry ?
2. If 9078 marbles are divided among 89 boys, how many will each receive ?
3. Multiply £2 13s. 9½d. by 39.
4. Divide £76 12s. 2d. by 29.

STANDARD IV.

Syllabus—9th Month.

More difficult reduction examples on all the Tables.

Test.

1. How many pound bags of sugar could be weighed from 13 cwt. 3 sto. 19 lbs. ?
2. Divide 51 yds. 2 ft. 10 ins. by 39.
3. Change 3 dys. 16 hrs. 19 min. 28 secs. to seconds.
4. Reduce 5018 half-pints to gallons.

STANDARD V.

Syllabus—9th Month.

(*a*) Compound Practice (all Tables).
(*b*) Simple bills.

Test.

1. Find value of 3 tons 17 cwt. 3 qrs. at £7 16s. 10d. per ton.
2. Find cost of paving a road 5 furlongs 6 chains 12 yds. in length at £7 10s. per mile.
3. Work this bill—
   5½ lbs. beef at 10½d. per lb.
   3 lbs. 14 oz. mutton at 8d. per lb.
   5¾ lbs. lamb at 11d. per lb.
4. Work this bill *mentally* and receipt it—
   2 lbs. tea at 2s. 8d. per lb.
   5 lbs. sugar at 2½d. per lb.
   20 eggs at 5 for 6d.
   1½ lb. coffee at 1½d. per oz.

STANDARD VI.

Syllabus—9th Month.

(*a*) Exercises in Mensuration, including Areas of Rectangles, Squares, Cubes, and Prisms. (*Boys.*)
(*b*) Revision of Rules. (*Girls.*)

Test.—(Boys.)

1. Find cost of a piece of mahogany 18 ft. long, 1 ft. 8 ins. wide, and 2 ins. thick, at 2s. 6d. per cubic foot.
2. What would it cost to asphalt a road 40 chains in length and 60 yards wide at 5s. 6d. a square yard?
3. What must be the thickness of a block of marble 32 ft. long and 8 ft. wide to contain 512 cubic feet?
4. Find the cost of papering a room 12 ft. high, 16 ft. long, and 10 ft. wide with paper 27 ins. wide and costing 1½d. a yard.

Test.—(Girls.)

1. Find the Simple Interest on £250 for 73 days at 2¾ per cent.
2. Divide ·06285 by 2·75 and express—

$$\frac{2}{5} \text{ of } 1\tfrac{2}{3} \text{ of } \frac{1}{10} \text{ of } \frac{3\frac{1}{2}}{5\frac{1}{4} \text{ of } 2\frac{1}{2}} \text{ as a dec.}$$

3. If I spend 14s. 6d. a week and wish to save £15 a year, what must be my monthly income?
4. A owns ·6 of an estate and B the remainder. If B's share is worth £75·5625, what should A's be worth?

STANDARD VII.

Syllabus—9th Month.

Consols: (*a*) Meaning of prices as stated daily in newspapers. (*b*) Gain or Loss by rise or fall of market. (*c*) Interest at current rate and rate per cent. on money invested.

Test.

1. If Consols are at 109, how much stock can I purchase by investing £500.
2. I bought 2¾% Consols when they were at 99, how is my rate of interest per cent. affected by investing again when they have risen to 110?
3. How much richer is a person who invests £1000 in Consols when they are at 101 and sells out when they rise to 114?
4. What difference in income would be derived from investing £250 in Consols worth 105 and bearing interest at 3% and the same sum put in the Post Office Savings Bank?

TESTS—NINTH MONTH ANSWERS.

Standard I.—(1) 94; (2) 25; (3) 85; (4) 27.
Standard II.—(1) £6 18s. 4d.; (2) £2 17s. 4¾d.; (3) £6 2s. 7½d.; (4) 19s. 3d.
Standard III.—(1) 142; (2) 102; (3) £104 17s. 0¾d.; (4) £2 12s. 10d.
Standard IV.—(1) 1517 lbs.; (2) 1 yd. 11 ins. + 37; (3) 317,968 sec.; (4) 313 gals. 5 pts.
Standard V.—(1) £30 9s. 8d.; (2) £5 5s. 11¾d.; (3) 4s. 9¾d. + 2s. 7d. + 5s. 3½d. = 12s. 8d.; (4) 5s. 4d. + 11¼d. + 2s. 0d. + 2s. 6d. = 10s. 9½d.
Standard VI.—(*Boys.*)—(1) 12s. 6d.; (2) £14,520; (3) 2 ft.; (4) 11s. 6¾d.
(*Girls.*)—(1) £1 7s. 6d.; (2) ·0228$\dot{5}\dot{4}$; ·0571428$\dot{5}$; (3) £4 7s. 10d.; (4) £113 6s. 10½d.
Standard VII.—(1) £458 14s. $3\frac{41}{100}$d.; (2) $\frac{5}{16}$% less; (3) £128 14s. $3\frac{8}{101}$d.; (4) 17s. 10¾d.

THE INSPECTOR'S NOTE-BOOK.

BY AN INSPECTOR OF SCHOOLS.

Primary Education in the chrysalis state. Primary education is more or less in the chrysalis state just now. The yard-stick and tape-measure are either gone or going, and inspection is being substituted for examination. As far as I can interpret the Code and Instructions, it is the desire of My Lords to give the good teachers rein. In plain English we are to keep away from the schools which are doing well. There are some who believe that an inspector ought always to do some teaching himself, even in the best schools. Others think that the less an inspector interferes in a good school the better. With the latter I agree.

* * * * * *

Effect of the new system on the young teachers. The new system must be judged by its results as regards the young teachers who are being bred under it. We ought to get more intelligent and thoughtful teachers. My advice to the juniors is, put more thought into your work. How many teachers, I wonder, really work out mentally little plans touching their teaching? It is impossible to become successful in any career without giving much thought to one's work, and this is more than ever true of the teaching profession.

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Bits from the Blue Book. Since writing my last notes the Blue Book has been issued. One or two of the reports are singularly good and well worth the attention of every teacher. I refer especially to those of Mr. King and Mr. Du Port. An interesting account is given by Mr. Pickard of how reading is sometimes taught. He says, 'At a recent visit to a school under Art. 84 B., two pupil teachers gave reading lessons during the course of the morning. One of the two lessons was from a geographical reading book, the subject-matter treating of the mountains of England and Wales. It is difficult to believe, but that pupil teacher actually utilised a map of Africa, which happened to be immediately in front of his class, to illustrate his lesson. The other teacher evidently thought discretion was the better part of valour and said nothing, but allowed the children to mumble for half-an-hour, and then the so-called reading lesson ended.'

Writing on the same subject Mr. Kenney-Herbert makes some valuable suggestions. He writes:—

'I am suggesting (1) plenty of variety as regards books, a matter about which there ought to be little difficulty if friendly arrangements were made between neighbouring schools for a periodical interchange of books; (2) that the children should read the new matter, phrasing it themselves under the teacher's guidance; (3) that all difficulties, and new words or expressions should be explained as they occur on the blackboard, which should be at the teacher's command at every lesson; and that at the conclusion of each lesson the class should be briskly questioned upon whatever the teacher has thought to be of sufficient interest to be written on the blackboard.'

The following remarks, too, of Mr. Currey on reading are of value:—

'The practice of making the standards in reading parallel with those in other subjects is a mistaken one, and it would be better by all fair means to help children to gain so much knowledge of the English language as would enable them to use books for learning their lessons generally; for example, lessons about common things and animals. The point to be kept in view should be the practical acquisition of the English language as a whole, and we should not unduly isolate the various exercises which appertain to the language, reading, recitation, writing, spelling, word-building, composition, and grammar. No amount of direct oral teaching can make up for the want of a habit of self-help such as is formed by the practice of reading with a view to understanding and remembering that which is read.'

* * * * * *

The Head Teacher should inspect. One word to the head teachers touching their periodic examinations. I think it is now generally recognised that it is impracticable and in-

jurious to be always examining. Why should not the head teacher do a little 84 B. work as well as the inspector? Otherwise how will he be able to get at the root of any weak spots? To this end he should keep a small note-book or diary. We will suppose he has found the reading weak in a certain standard at his set examination. Let him take an early subsequent opportunity of spending ten minutes looking on at a reading lesson in that class. He will then most probably discover the cause and be able to prescribe a remedy.

* * * * * *

Inspection plus less frequent Examinations. This is all important in the smaller schools where the head is attached to a class. Where the head teacher is free he has ample opportunity of attending to methods and results. I often meet masters who know little about certain of their assistants who work in class-rooms. They tell me they cannot leave their own classes to be constantly examining. Quite true, but they should inspect occasionally for a few minutes where they are aware that weaknesses exist. Then a note should be made in the pocket-diary, and possibly that subject will not need examining at the periodical examination. For my own part I should be inclined to say that a few minutes' inspection now and again would be more efficacious where the head teaches a class than frequent set examinations.

* * * * * *

How the Teachers like Art. 84 B. Some teachers I find are saying they get too many visits under the new system, others consider we are slighting them in visiting perhaps only once in the year. One very good master, who has a staff of certificated assistants, told me they had been expecting me daily for several months and were very disappointed that I had not come to see the work as it was going on. To my friends of this latter class I would say 'Do not lean too much upon the inspector. You must not expect him quarterly to weigh up your work and criticise or encourage.' Some masters I know like an inspector to drop in and back up their criticisms or encouragements. We have too much to do levelling up the weak to be inspecting the strong so very often.

* * * * * *

Teach the Children to wield the Pen. One thing one finds at first visits is a rather too free use of the slate. In fact I have found schools where no exercise-books other than copy-books are used throughout the year. Such is to be deplored. Slates are very useful in arithmetic occasionally for teaching new rules, but exercise-books should be used all the year through, especially in the upper standards. A ready use of the pen is one of the chief aims of primary education. How very few children who have passed the seventh standard can turn out a letter in brisk time!

* * * * * *

On Attendance. The attendance-banner boom is slowing down a little just now. This is only one of the many points which go to prove how resourceful the successful teacher must be. Sundry and manifold are the means adopted to procure good attendance. No one method alone will do. The banner will last until its novelty is gone. It is for the teacher to adopt another method when he finds things flagging. So much depends, too, upon the individual influence of the teacher. A head teacher should see all the absentees upon their return and inquire of each individually. Notes are useful in the hands of a good teacher. Make the school so attractive to the child that he will never willingly stay away. Take the names daily of the absentees in an exercise-book and send to their homes.

* * * * * *

On the choice of Pupil Teachers. In the selection of pupil teachers too much attention is now being given to their ability as students and too little to their teaching capabilities. The most learned people can often not impart their knowledge. To the usual examination of intending pupil teachers I would add an inspection of their method of handling a class. Marks might be allowed for this. It would not take long to find out whether a candidate is likely to be anything of a disciplinarian. No junior pupil teachers should be in charge of classes. They should learn their trade under the guidance of adult teachers as in other trades and professions. It is only in the teaching profession that beginners are considered capable of doing work before they have learnt how.

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A CORRESPONDENT sitting for Second Year Certificate next year has asked me a question which I think may be of interest to others. He wished to know whether, in addition to presenting English, Geography and History, and Mathematics, he might gain marks for one or two sciences to be taken next May.

My advice to all candidates is to write to the Secretary, Education Department, for a copy of the regulations for Certificate Examination. It will therein be found that—

1. All must take English.
2. All must take any two, *but no more than two*, of the following groups: (*b*) Geography and History; (*c*) Mathematics; (*d*) Two Sciences; (*e*) Two Languages; (*f*) Two of the following:—(1) One Language; (2) One Science; (3) Political Economy.

'Students who take group (*d*) must, if they take group (*f*), select (1) and (3). Those who take group (*e*) must, if they also chose group (*f*), select (2) and (3).

'No credit is given for any subject in addition to those in the groups selected.'

(Report of the Committee of Council on Education, p. 307.)

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P.B. writes saying he has twice applied to the Department for permission to sit at ensuing Queen's Scholarship Examination, but has got no reply. My advice to him is to get the corresponding Manager of his school to write at once asking whether or no the application has been overlooked. Note that the applicant must not write himself. The regulation runs, 'Candidates cannot be admitted unless application has been made on their behalf before October 1st.'

P.B. need not be alarmed if his Managers have applied. He must not expect his permit to sit until about the 2nd week in November, for the regulation runs 'The exact address of the place of examination will be communicated as early as possible in November.'

E.T.G. writes to me to know whether on a very wet or snowy day he can, for the sake of the average, close the school without notice. Also whether at the end of the year, to make up the minimum 400 times open, he may take into calculation the number of times the school has been closed for bad weather. E.T.G. has a small rural school, the attendance at which is being seriously affected by the rainy season now prevailing. He has my sincere sympathies. My reply is:—

(1) He cannot reckon the wet days when school was closed towards the 400. A 400 attendances can be made in 40 weeks. This will allow for a big number of wet days.

(2) The article which says notice must be given to the Inspector, is meant to meet all ordinary cases. There will always be extraordinary occasions not covered by this article, though possible of rare occurrence. An Inspector would unquestionably treat such in a common sense manner.

(3) According to the note subjoined to Art. 12 in the N.U.T. edition of the Code, the Department has ruled, 'If children reach the school so wet that sitting in the school during the usual hours is likely to be injurious, the Managers may properly send them home at once.'

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All communications to be answered in these columns should be addressed, 'Inspector,' care of the Editor.

We shall have pleasure in forwarding, post-free, to any Subscriber, a complete set of Solutions to Mr. Workman's 'Arithmetic Prize Papers' upon receipt of a postcard addressed to the Office of this Journal.

QUERY COLUMN.

RULES.

1. Each correspondent is restricted to *one* question.
2. Each query must be accompanied by the *coupon* which appears on the back wrapper of the current number of the Journal.
3. Correspondents will oblige by stating, whenever possible, the source from which their query has been obtained.

The Editor of the PRACTICAL TEACHER reserves to himself the right to decline to answer any question which is, in his judgment, unsuited to the Magazine.

Herne Hill.—Solve :—

$$\left(\sqrt{\frac{x}{y}}-\sqrt{\frac{y}{x}}\right)^2+\sqrt{y}\left(\sqrt{x}-\frac{\sqrt{y}}{2}\right)=\frac{x}{\sqrt{y}}\left(\sqrt{x}-\frac{y}{\sqrt{2}}\right). \quad (A)$$

$$9.\frac{\sqrt{x}}{\sqrt{y}}+\frac{3\sqrt{y}}{\sqrt{x}}=(21\sqrt{2x}-1)\frac{\sqrt{y}}{2\sqrt{x}}+\frac{1}{2\sqrt{xy}}. \quad (B)$$

From (A)

$$\frac{x}{y}+\frac{y}{x}-2+\sqrt{xy}-\frac{y}{2}=\frac{x\sqrt{x}}{\sqrt{y}}-\frac{x\sqrt{y}}{\sqrt{2}}.$$

$$\frac{x}{y}+\frac{y}{x}-2-\frac{y}{2}=\frac{x\sqrt{x}}{\sqrt{y}}-\frac{x\sqrt{y}}{\sqrt{2}}-\sqrt{xy}.$$

$$\frac{2x^2-4xy+y^2-xy^2}{2xy}=\frac{x\sqrt{2x}-xy-y\sqrt{2x}}{\sqrt{2y}}.$$

$$\frac{2(x^2-2xy+y^2)-xy^2}{2xy}=\frac{2x\sqrt{x}-xy\sqrt{2}-2y\sqrt{x}}{2\sqrt{y}}.$$

$$\frac{\{\sqrt{2}(x-y)-y\sqrt{x}\}\{\sqrt{2}(x-y)+y\sqrt{x}\}}{2xy}$$

$$=\frac{\sqrt{2x}\{\sqrt{2}(x-y)-y\sqrt{x}\}}{2\sqrt{y}}.$$

Divide each side by $\sqrt{2}(x-y)-y\sqrt{x}$.

Then $$\frac{\sqrt{2}(x-y)+y\sqrt{x}}{2xy}=\frac{\sqrt{2x}}{2\sqrt{y}}.$$

$$\therefore \sqrt{2}(x-y)+y\sqrt{x}=x.\sqrt{y}.\sqrt{2x}.$$

And $$\sqrt{2}(x-y)-y\sqrt{x}=0.$$

$$\therefore \sqrt{2}(x-y)=y\sqrt{x}.$$

And $$2(x-y)=y\sqrt{2x}. \quad (C)$$

From equation (B)

$$\frac{9x+3y}{\sqrt{xy}}=\frac{21\sqrt{2xy}-\sqrt{y}}{2\sqrt{x}}+\frac{1}{2\sqrt{xy}}$$

$$=\frac{21y\sqrt{2x}-y+1}{2\sqrt{xy}}.$$

Mult. each side by $\sqrt{xy}$.

Then $$9x+3y=\frac{21y\sqrt{2x}-y+1}{2}.$$

And $$18x+6y=21y\sqrt{2x}-y+1.$$

$$\therefore 7y-21y\sqrt{2x}=1-18x.$$

And $$y=\frac{1-18x}{7-21\sqrt{2x}}. \quad (D)$$

Substitute in (C)

$$2x-\frac{2-36x}{7-21\sqrt{2x}}=\frac{\sqrt{2x}(1-18x)}{7-21\sqrt{2x}}.$$

Mult. by $7-21\sqrt{2x}$.

$$14x-42x\sqrt{2x}-2+36x=\sqrt{2x}-18x\sqrt{2x}.$$

$$24x\sqrt{2x}-50x+\sqrt{2x}+2=0.$$

Mult. all terms by $\sqrt{2}$.

$$48x\sqrt{x}-50x.\sqrt{2}+2\sqrt{x}+2\sqrt{2}=0.$$

$$\therefore 48x^{\frac{3}{2}}-50x.2^{\frac{1}{2}}+2x^{\frac{1}{2}}+2^{\frac{3}{2}}=0.$$

i.e., $$48x^{\frac{3}{2}}-48x.2^{\frac{1}{2}}-2x.2^{\frac{1}{2}}+2x^{\frac{1}{2}}+2^{\frac{3}{2}}=0.$$

And $$48x(x^{\frac{1}{2}}-2^{\frac{1}{2}})-(2x.2^{\frac{1}{2}}-2x^{\frac{1}{2}}-2^{\frac{3}{2}})=0.$$

$$48x(x^{\frac{1}{2}}-2^{\frac{1}{2}})-2^{\frac{1}{2}}(2x-x^{\frac{1}{2}}.2^{\frac{1}{2}}-2)=0.$$

$$48x(x^{\frac{1}{2}}-2^{\frac{1}{2}})-2^{\frac{1}{2}}\{(x^{\frac{1}{2}}-2^{\frac{1}{2}})(x^{\frac{1}{2}}+2^{\frac{1}{2}})\}=0.$$

Divide by $x^{\frac{1}{2}}-2^{\frac{1}{2}}$.

Then $$48x-2^{\frac{1}{2}}(2x^{\frac{1}{2}}+2^{\frac{1}{2}})=0. \quad (E)$$

And $$x^{\frac{1}{2}}-2^{\frac{1}{2}}=0.$$

$$\therefore x^{\frac{1}{2}}=2^{\frac{1}{2}}.$$

Square each side.

$$x=2.$$

From (C) $$2(2-y)=y\sqrt{2}\times 2$$

$$=2y.$$

$$2-y=y,\ 2y=2,$$

and $$y=1.$$

From (E) $$48x-2^{\frac{1}{2}}(2x^{\frac{1}{2}}+2^{\frac{1}{2}})=0.$$

$$\therefore 48x-2x^{\frac{1}{2}}.2^{\frac{1}{2}}-2=0,$$

or

$$24x-1=x^{\frac{1}{2}}.2^{\frac{1}{2}}.$$

Square both sides.

$$576x^2-48x+1=2x.$$

And $$576x^2-50x+1=0.$$

$$\therefore (18x-1)(32x-1)=0.$$

$$\therefore x=\tfrac{1}{18} \text{ and } \tfrac{1}{32}.$$

Substitute these respective values in (C).

$$y=\tfrac{1}{21} \text{ and } \tfrac{1}{9}.$$

$$x=2,\ \tfrac{1}{18},\ \tfrac{1}{32}.$$

$$y=1,\ \tfrac{1}{21},\ \tfrac{1}{9}.$$

F. Almond (*Wood Plumpton*).—A platinum bar expands $\frac{1}{113100}$ of its length at 0° C. for a rise of temperature of 1° C., and copper expands $\frac{1}{58200}$ for the same. Find the lengths at 0° C. of two bars, one of platinum and the other of copper, such that whatever be the temperature, the difference of their lengths may be always 50 centimetres.—(Civil Service.)

P = platinum, C = copper.

If the difference is to be a constant one, it follows that :

$$\frac{1}{113100}\text{P} \times \text{any no.} = \frac{1}{58200}\text{C} \times \text{same no.}$$

Then $$\frac{1}{113100}\text{P}=\frac{1}{58200}\text{C}.$$

$$\therefore 58200\text{P}=113100\text{C} \div 300.$$

And $$194\text{P}=377\text{C}.$$

Now P is evidently greater than C, and must, by terms of question, be always 50 centim greater than C.

$$\therefore \text{P}=\text{C}+50 \text{ centim.}$$

$$\therefore 194(\text{C}+50 \text{ centim.})=377\text{C}.$$

$$\therefore 194\text{C}+9700 \text{ centim.}=377\text{C}.$$

$$\therefore 9700 \text{ centim.}=377\text{C}-194\text{C}$$

$$=183\text{C}.$$

$$\therefore \text{C}=\frac{9700}{183} \text{ centim.}=53\frac{1}{183} \text{ centim.}$$

$$\text{P}=\text{C}+50 \text{ centim.}$$

$$=53\tfrac{1}{183} \text{ centim.}+50 \text{ centim.}$$

$$=1 \text{ m. } 3\tfrac{1}{183} \text{ centim.}$$

M. Browne.—See Rule 2.

Max.—A railway carries 1st, 2nd, and 3rd class passengers between A and B. The fares were, one year, in the ratio 7 : 5 : 4 ; the total number of passengers was 100,000, and the receipts £49,000. The next year, the 3rd class fare was reduced 25 per cent., and it was found that while the number of 3rd class passengers increased 50 per cent., the 2nd class diminished 10 per cent., and the 1st class 5 per cent., the number of passengers increased to

TITLES OF THE SCHOOL BOOKS SUPPLEMENT PRESENTED WITH THIS NUMBER.

121,000, and the receipts to £49,300. Find the 1st, 2nd, and 3rd class fares, and the number of passengers during the first year.—(Matric., Lond. Univ., June 1883.)

Let x = no. of 3rd class passengers in 1st year.

y = no. of 2nd class passengers in 1st year.

Then $100{,}000 - x - y$ = no. of 1st class passengers in 1st year.

Then $1\frac{1}{2}x$ = no. of 3rd class passengers in 2nd year.

$\frac{9}{10}y$ = no. of 2nd class passengers in 2nd year.

$\frac{19}{20}(100{,}000 - x - y)$ = no. of 1st class passengers in 2nd year.

$\therefore 1\frac{1}{2}x + \frac{9}{10}y + \frac{19}{20}(100{,}000 - x - y) = 121{,}000.$

Mult. by 20,

$$30x + 18y + 1{,}900{,}000 - 19x - 19y = 2{,}420{,}000.$$

$$\therefore 11x - y = 520{,}000. \quad (A)$$

In 1st year,

Total fares 1st class : total 2nd class : total 3rd class

$$:: 7(100{,}000 - x - y) : 5y : 4x.$$

$\therefore$ Fraction which 3rd class fares form of the whole

$$= \frac{4x}{7(100{,}000 - x - y) + 5y + 4x}$$

$$= \frac{4x}{700{,}000 - 3x - 2y}$$

Since the total fares = £49,000, the 3rd class fares in the 1st year

$$= £\frac{4x \times 49{,}000}{700{,}000 - 3x - 2y}.$$

Since in the 2nd year the 3rd class fare is $\frac{9}{8}$ of what it was before, while the no. of passengers is $1\frac{1}{2}$ what it was before, the total 3rd class fares $= \frac{9}{8} \times 1\frac{1}{2}$, *i.e.* $\frac{27}{16}$, or $112\frac{1}{2}$ per cent. of what they were in the 1st year.

As ratio of respective fares in 2nd year : fares in 1st year

is as $95 : 100 : 112\frac{1}{2}$,

And as ratio of these fares in 1st year

is as $7(100{,}000 - x - y) : 5y : 4x$,

$\therefore$ for 2nd year,

Total fares 1st class : total 2nd class : total 3rd class

$$= 7 \times 95\,(100{,}000 - x - y) : 5y \times 90 : 4x \times 112\tfrac{1}{2}$$

$$= 133\,(100{,}000 - x - y) : 90y : 90x.$$

Then the fraction which 3rd class fares in 2nd year form of the whole

$$= \frac{90x}{133(100{,}000 - x - y) + 90y + 90x}$$

$$= \frac{90x}{13{,}300{,}000 - 43x - 43y}$$

Since the total fares for the 2nd year = £49,300, the 3rd class fares in the 2nd year

$$= £\frac{90x \times 49{,}300}{13{,}300{,}000 - 43x - 43y}.$$

But the total 3rd class fares in the 2nd year $= \frac{9}{8}$ of what they were in the 1st year.

$$\therefore \frac{90x \times 49{,}300}{13{,}300{,}000 - 43x - 40y} = \frac{9}{8} \cdot \frac{4x \times 49{,}000}{700{,}000 - 3x - 2y}.$$

$$\therefore \frac{2465}{13{,}300{,}000 - 43x - 43y} = \frac{245}{2(700{,}000 - 3x - 2y)}.$$

Multiplying across,

$$245(13{,}300{,}000 - 43x - 43y) = 4930(700{,}000 - 3x - 2y).$$

$$\therefore 49(13{,}300{,}000 - 43x - 43y) = 986(700{,}000 - 3x - 2y).$$

$$\therefore 651{,}700{,}000 - 2107x - 2107y = 690{,}200{,}000 - 2958x - 1972y.$$

$$\therefore 851x - 135y = 38{,}500{,}000. \quad (B)$$

By (A) $11x - y = 520{,}000$

Mult. (A) by 135,

and $1485x - 135y = 70{,}200{,}000.$ (A)

$851x - 135y = 38{,}500{,}000.$ (B)

Subtract (B) from (A),

$$634x = 31{,}700{,}000.$$

$$\therefore x = 50{,}000 \text{ (3rd class passengers).}$$

By (A) $y = 11x - 520{,}000$

$= 30{,}000$ 2nd class passengers.

Then 1st class passengers

$= 100{,}000 - (50{,}000 + 30{,}000)$

$= 20{,}000.$

Then the total fares in 1st year (£49,000) have to be divided amongst 1st, 2nd, and 3rd class passengers respectively, in the ratio of

$$7 \times 20{,}000 : 5 \times 30{,}000 : 4 \times 50{,}000$$

$$= 14 : 15 : 20.$$

Then total 3rd class fares in 1st year,

$$= £\frac{49{,}000 \times 20}{14 + 15 + 20} = £20{,}000.$$

$\therefore$ A single 3rd class fare in 1st year

$$= £\frac{20{,}000}{50{,}000} = 8s.$$

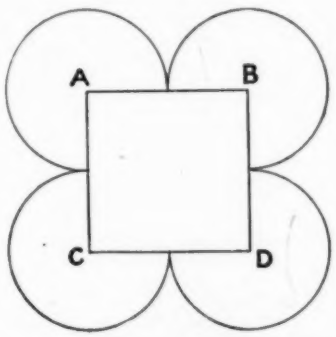
Then a 2nd class fare $= \frac{5}{4}$ of 8s. = 10s., and a 1st class fare $= \frac{7}{4}$ of 8s. = 14s.

Ans. 1st class, 20,000 passengers at 14s.

2nd class, 30,000 passengers at 10s.

3rd class, 50,000 passengers at 8s.

J. Brown.—A quatrefoil is formed by drawing arcs of circles, having the angular points of a square as centres, and having radii equal to half a side of the square. Given the length of a side of the square, find the area of the quatrefoil. (Heley's Mensuration.)



Let ABCD be the given square, the angular points of which form the centres of the quatrefoil, and let one side of the given square = a. Then one half of a side = $\frac{a}{2}$.

The area of the given quatrefoil = the area of the squares + the parts of the areas of the circles having the angular points as centres, which lie outside the square. Each circle has one quadrant, or $\frac{1}{4}$ of its area within the square, and $\frac{3}{4}$ of its area outside the square. Then since the circles are equal, the total areas lying outside the square $= \frac{3}{4} \times 4$, or three times the whole of one of the circles.

But as the area of a circle $= \pi r^2$, and r in this case $= \frac{a}{2}$, the whole area of one circle $= \frac{\pi a^2}{4}$, and three times the whole area of one circle $= \frac{3\pi a^2}{4}$.

The whole area of the quatrefoil = the area of the square, or a^2, in addition to this.

$\therefore$ Area of quatrefoil

$$= a^2 + \frac{3\pi a^2}{4}$$

$$= a^2\left(1 + \frac{3\pi}{4}\right), \text{ i.e., taking } \pi = 3\tfrac{1}{7},$$

$$= a^2\left(1 + \frac{3}{4} \times \frac{22}{7}\right)$$

$$= a^2\left(1 + \frac{33}{14}\right) = \frac{47a^2}{14}.$$

Lex.—Apply to Somerset House, Strand. The cost is nominal. Solutions to other queries next issue.

Integer.—Please forward copy of logs. referred to.

N.B.—Several solutions to queries are unavoidably held over this month.

LET THE SUN GO DOWN IN PEACE.

(A TWO-PART SCHOOL SONG.)

BY D. BROOKES, L.T.S.C.

d :r :m | r :— :— | s, :m, :f, | s, :— :l, | s, :d :r
sun..... to rest ; Gen - - tly close the droop - ing
an - ger burn ; Kneel not to your ev - 'ning
fe, :— :fe, | s, :— :f, | m, :d, :r, | m, :— :f, | m, :— :r,
sun..... to rest ;..... Gen - - tly close the droop - ing
an - - ger burn ;..... Kneel not to your ev - - 'ning
m :d :l, | s, :f :m | r :— :l, | t, :d :r | d :— :—
flow - - - ers, Soft - - ly fall the ev - - 'ning hours.
prayer,..... With..... re - sent - ment lurk - - ing there.
d, :m, :f, | m, :l, :s, | f, :— :f, m, | r, :m, :f, | m, :— :—
flow - - - ers, Soft - - ly fall the ev - - 'ning hours.
prayer,..... With..... re - sent - ment lurk - - ing there.
SEMI-TWO-PART CHORUS or UNISON, ad lib.
Key F. t.
s :— :l | s :— :l .t | d' :t :l | l :— :s
Hush'd is ev - - - 'ry wood - land note,.....
God, who bids you dwell in love,.....
t, :m :— :f | m :— :f | m :s :f | f :— :m
Hush'd is ev - - - 'ry wood - land note,.....
God, who bids you dwell in love.....
mp

Bee's..... loud hum and lin - - net's throat ;
God,..... who sees you from..... a - bove,
Bee's..... loud hum and lin - - net's throat ;
God,..... who sees you from..... a - bove,
Si - - - lent is the li - - - quid breeze,.....
He is grieved your pride..... to see,.....
Si - - - lent is the li - - - quid breeze,.....
He is grieved your pride..... to see,.....
f
sostenuto.
Moon - - beams kiss..... the nest - - ling trees.
Ev - - - 'ry time..... you dis - - - a - gree.
Moon - - beams kiss..... the nest - - tling trees.
Ev - - - 'ry time..... you dis - - - a - gree.
f
sostenuto.
rit.

CHORUS.
f. Key B♭.
Ere..... the lov - - ing stars a - rise,..... Ere soft
Ere..... the lov - - ing stars a - rise,..... Ere soft
mf a tempo.
slum - - ber seals your eyes, Chil - - dren, bid your
slum - - ber seals your eyes,..... Chil - - dren, bid your
rall.
quar - rels cease,..... Let the sun go down in peace.
rall.
quar - rels cease,..... Let the sun go down in peace.
f
rall.

EDUCATION ABROAD.

THE Danish population of Northern Schleswig has for some time been agitating for the teaching of Danish in the elementary schools. This question of school languages is a difficult and perplexing one. Where children speak one language from infancy, and the school is conducted in another, the chances are that they will not master either properly. We have happily solved the question in Wales by teaching English through the medium of Welsh; a similar solution will no doubt eventually be applied to the West of Ireland. The Schleswig people seem to be fully alive to the importance of a knowledge of German; and the inhabitants of the island of Röm have drawn attention to the advantages of German for nautical purposes. But the mere elementary knowledge of two languages has an educational advantage which should not be lost sight of. It quickens the mental faculties, enlarges the horizon, and delivers the mind from the 'tyranny of empty words.' Where the masses of the population are blessed with this boon, it is unwise to use the school as a means of depriving them of it.

* * * * * *

SOME useful hints are given by the *Rothe Kreuz* about the best kinds of needlework for little girls. Knitting and crochet work may safely be given to children over seven years. There is less danger of injuring the sight or the spine than in reading and writing. The ball of thread should not be kept under the arm and pressed against the ribs. White embroidery on a white ground (such as Mountmellick work) is especially injurious to the eyes, owing to the want of contrast. All needlework should be interrupted at short intervals, and relieved by exercise in the open air, where the eye can look into the distance, and if possible into woods and meadows.

* * * * * *

THE preference for female teachers officially introduced into the middle-class school system in Vienna has had some injurious consequences. Male teachers of ten years' experience have had to be passed over in favour of female teachers of five years' experience. The *Stadtrath* is now petitioning for a more equable distribution of appointments.

* * * * * *

WHAT class of teachers are most subject to pulmonary consumption? The *Deutsche Blätter* says that the frequency of this disease is least in High School (*Gymnasium*) teachers, and greatest in rural teachers. It is evident that the advantages of purer air in the country are more than balanced by the lower salaries and consequent inferior nutrition.

* * * * * *

THE first German Continuation School Congress was held at Leipzig on September 19. Attendance at continuation schools has been made compulsory in nine of the states composing the German Empire. The kingdom of Saxony has 2,000 continuation schools with three-year courses. It is far ahead of the rest of Germany, and the largest states—Prussia and Bavaria—have not made attendance compulsory at these schools. In Berlin alone 30,000 young men have to do without them. At the Congress, Herr von Schenckendorff stated that Germany was behind other countries in this matter. This statement is so novel, and so surprising in view of the wonderful educational advancement of Germany, that one cannot help thinking it was a mere rhetorical turn. The Congress, however, fully endorsed the speaker's demand for making attendance compulsory at continuation schools (*Fortbildungs Schulen*), especially in consideration of the new rights and duties of self-government devolving upon German manhood.

* * * * * *

MORE than 500 pupils took part in the recent swimming race organised by the Paris School Board, which was held in the swimming bath of the Rue Rochechouart. The distances were 100 yards and 300 yards. Special races were held for boys under ten. The prizes consisted of silver and bronze medals.

* * * * * *

COLOGNE has a class for plain cookery, to which all the girls of the highest elementary school class are admitted free. It is under the management of a teacher's widow, trained at the Kassel School of domestic economy.

* * * * * *

THE *North German Gazette* gives some particulars of the new regulations concerning the military service of school teachers. After the Franco-German War the teachers were for some time exempted from service. They had 'won the battles,' and that was their reward. This exemption led to a crowding in the ranks of the teachers, and the military obligations were gradually re-introduced among them. Up to the year 1900 they will have to serve ten weeks; after that they must all serve a full year. But they may serve as 'one-year volunteers' if they possess the educational qualifications; and if, in addition, they undertake to provide their own uniforms and maintenance, they are allowed to choose their own regiment, and are granted other privileges. For all that, we expect they will envy their British and American colleagues, who are altogether free from the incubus.

* * * * * *

THAT stammering is sometimes a contagious psychological disease is proved by Dr. E. Winckler in the *Wiener Medizinische Wochenschrift*. An investigation of 210 cases of stammering in the elementary schools of Bremen showed that 16 per cent. had originated at school. That this has much to do with shyness and nervousness in speaking before a class or to the teacher is made evident by the fact that 70 stammering pupils had an aggregate of 136 younger brothers and sisters which had not acquired the fault.

* * * * * *

THE *Schulgesundheitspflege* gives some valuable figures illustrating the fatigue of pupils produced by the different subjects of instruction. These were obtained by Sikorsky and Laser by counting the numbers of faults in dictation and reckoning at the beginning and the end of the lesson respectively. The former observed an increase of 20 to 40 per cent. in dictation exercises; Laser found an increase of 13 per cent. But some pupils work better after a time, and others work evenly all through the lesson. Dr. Kemsies also used Mosso's ergograph for observing muscular fatigue. This is rapidly produced by concentrated attention, combined with mental or bodily exertion. Mathematics and gymnastics produce such fatigue to a high degree; whereas history, geography, and science bring about a restitution of force. The plan of lessons should be carefully arranged so as to vary the subjects according to their effect upon nervous and muscular energy.

* * * * * *

DR. W. FRANKEN, in the same paper, gives a serious warning against the abuse of exposing the feet too much to sea-water at the seaside. Children are allowed, he says, to play about in the water with bare feet for two or three hours at a time, with the rest of their bodies exposed to a broiling sun. No wonder they often complain of sudden headaches, nausea, and depression of the heart. Another danger lies in the bits of glass and other sharp objects which cannot always be effectually removed, and produce bad cuts. Perhaps the best remedy would be to allow the children to wear sandals. The 'pampooties' worn by the Arran Islanders in Galway Bay, and made by turning up and stringing round the edges of an oblong piece of raw cowhide, are the ideal footgear for the purpose, especially as they must be worn wet in order to remain soft.

OUR AMATEUR PHOTOGRAPHIC PRIZE COMPETITION.

WE regret we were prevented last month from giving specimens of the work sent in in connection with this Competition. Owing to the great interest manifested by our readers, we have now specially arranged space for two pages of reproductions, which may be said to fairly represent the various types received in accordance with the conditions. We trust our readers will appreciate the permanent form in which the illustrations are presented.

A MOMENT'S REST.
F. Kearney.

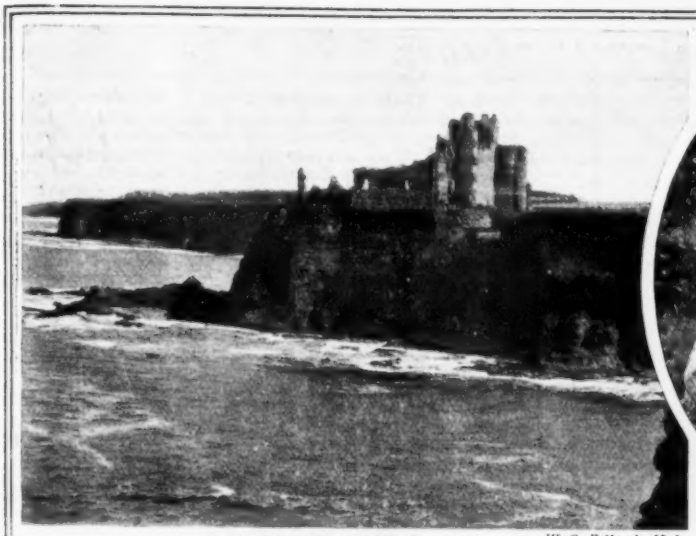
SEA SHORE.
John Howell.

SCHOOL BUILDINGS, HINTON ADMIRAL.
Horatio Ellwood.

CARISBROOKE CASTLE, I.O.W.
Robert A. Campbell.

COALING VESSELS AT DOUGLAS, I.O.M.
Albert E. Mailburn.

ENJOYING THE RIDE.
H. Rindell.



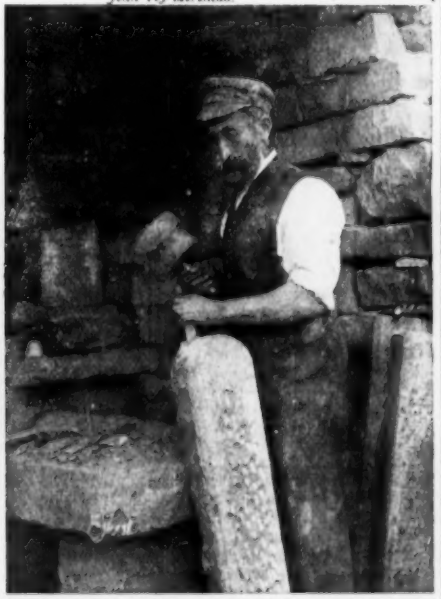
TANTALLON CASTLE.
W. G. Folkarde, M.A.

DOLLY'S TEA-PARTY.
A. Davies.

WATERFALL IN GLEN MEAY, I.O.M.
James H. Harris, F. R. Hist. Soc.

KYNAME COVE, NEAR LIZARD HD.
John Toy Morshead.

BARGE SAILING ON R. DON.
Pryce Jones.



STONE MASON AT WORK. *Edward Lumley.*

OUR FRENCH PRIZE COMPETITION.

PRIZE AWARD—OCTOBER.

The Prize is awarded to *Celt*, the pseudonym of
T. M. O'Callaghen, Coll. School, Bridgwater, Somerset.

First Class.—R.F.D., Meliora, Buchan, Un Pauvre, Jena, Bilbao, Pansy Ellick, Cosmopolite, Vincent, Nortoniensis, Pimpernel, Sesame, Dauphin, Eudore, Thistle, Primrose, Andromache, Tyro, Syd, Jet.

Second Class.—Maid Marian, Philomena, Antoinette Vernet, Campanule, Beau idéal, Middleton, Sigma, Amica, St. John, Perseverance, Pentland, Irene, Robyn, Moira, Martin, Jeunesse, L'homme qui rit, Coed-Mawr, Snail, Boss, Palikare, Suaviter in modo, Ajax, Rothseiana, Camillus, Iserne, Staffs, Heathen Chinee, Teesdale, Francesca, Chuckie, Etak, Mars, Try, B.

Third Class.—Old Sarum, Horatio, Friar Tuck, Olivia, Blackbird, Irlandaise, Fernleaves, Zoe, Ignoramus, Jubilarian, Patience, Tiro, Christine, Dunelm, Souvenir, Vittoria, Cambria, Moray Firth, M'Gwyn, Molly, Clarendon, St. Elmo, Excelsior, Carreopeia, Agricola, Priamides, En Avant, Adam, Grey Hope, Homer, Verus, Volapuk, Phono, Westward Ho, Fide et Virtute, Eugenie, Kathleen, Sans Espérance, Esther, Hawthorne, Kettering, Amicia 2, School-girl, Daffy, Oedipus Rex, Integer, Verger, Royal Blue.

La dispute des idéalistes et des réalistes n'est pas nouvelle. Je ne ferai à ces derniers qu'une objection. 'Si vous ne me présentez que ce qui est, sous les rayonnements de l'art et les reflets de l'infini, comme Rembrandt, ce grand amoureux de la Vérité et non du Réel, pourquoi voulez-vous que je vous lise? Tout est un spectacle, sans doute, mais j'aime mieux voir ce spectacle sur le théâtre de la vie que dans vos ouvrages. Qui m'assure qu'à votre insu vous n'avez point altéré les traits de vos modèles? Je ne me sens aucune inclination à devenir amoureux sur la foi d'un photographe. Vous aurez beau m'affirmer que la lumière et l'ombre ont joué d'elles-mêmes, que votre héroïne s'est fixée comme dans un miroir, je vous croirai et j'admirerai volontiers votre adresse; mais si, par aventure, votre beauté est belle, je vous demanderai à voir la femme.'

En face d'un point de vue si limité je me demande si je ne préférerais pas l'exagération contraire. Des philosophes ont prétendu que l'homme seul existait, et que la nature était un rêve et une illusion. Sans aller jusque-là, on peut bien soutenir que chacun de nous décompose le monde extérieur avec l'ensemble de ses facultés et de ses sentiments. Pour le chasseur, l'oiseau est une proie; pour le savant, c'est un squelette; pour le laboureur, c'est un ennemi qui mange le grain; pour le poëte, c'est un chanteur ailé; pour l'amoureux, c'est un souvenir harmonieux. Le paysage chante avec le paysagiste. Tous les tableaux visibles sont des souvenirs d'idées qui mûrissent dans la tête ou dans le cœur de l'homme. Décrire pour décrire, à quoi bon? Les images ne sont pas des ressemblances; elles ont passé par la lanterne magique de notre souvenir; elles se sont transformées au contact de nos sentiments les plus intimes. La campagne que je vois seul n'est plus celle que je vois à deux. Le coucher du soleil que je contemple avec un sentiment d'espérance dans l'âme ne ressemble point à celui que je regarde un jour de désenchantement. Dans le premier cas, ce soleil me dit: *Au revoir!* Dans le second, il m'a dit: *Adieu!*

Arsène Houssaye.

Translation by *Celt*.

There is nothing new in the controversy between the idealists and realists, and to the doctrines of the latter I shall offer but one objection.

If you depict in your works solely that which actually is, even though you may, in imitation of Rembrandt, that great lover of the Truth but not of the Real, shed upon it the radiance of art and interweave it with the infinite, why should I peruse your labours? Life is perhaps a mere theatrical spectacle; but, if so, I would rather witness its representation by living actors than read your description of it. How can I be sure that you have not, unknown to yourselves, failed to faithfully copy your models?

I am not inclined, for instance, to fall in love on the strength of a photograph. You will vainly tell me that light and shade alone have produced it, that your heroine is reflected there as in a mirror. I shall believe you and freely admire your skill, but, if the lady happens to be fair, I shall ask to see her.

In the face of so limited a point of view, I doubt if I do not greatly prefer the exaggerations of those on the opposite side. Philosophers have maintained that only man exists, and that nature is but a dream or illusion. Without going so far as that, it may very properly be said that each one forms his conception of the outer world according to his own feelings and faculties. For instance, to the sportsman, birds are merely game; to the anatomist they are simply skeletons. The labourer thinks of them as crop-destroying pests; the poet calls them feathered songsters; and the lover, again, deems them symbols of felicity. The landscape lives under the painter's brush, and all pictures may be rightly considered souvenirs of ideas which have ripened in the mind or heart of man.

Where, then, lies the utility of so-called realistic description? Images are not likenesses; they have passed through the magic lantern of our memory; they have become transformed through contact with our innermost sentiments. The country I view by myself appears to me far different when I am with a companion. The sunset which I contemplate when in good spirits little resembles that which I watch when downhearted. In the first case, old Sol seems to say quite cheerfully to me *au revoir*. In the second he bids me a gloomy good-bye.

Celt.

Sous les rayonnements de l'art et les reflets de l'infini was the first pitfall. Some, in their evident despair to find a suitable rendering, suggested a misprint of some kind, while others made a rough guess at the meaning.

Que je vous lise is not 'that I may read to you,' but 'that I should read your works.'

Un spectacle is not a picture, but a play. Surely there was no need for so many mistranslations of *à votre insu;* the phrase can be found in any dictionary.

Ont joué d'elles-mêmes means 'have played their part.' Many competitors drew largely upon their imagination when rendering this phrase. An excellent version was marred by the line, 'have come and gone at their own sweet will.'

To render '*la femme*' by 'the woman,' spoils the beauty of the phrase entirely.

Un point de vue is here 'a conception,' not 'a view.'

Décompose was another stumbling-block. Most competitors gave 'to decompose' instead of 'to analyse,' or even 'to change.'

Un souvenir harmonieux is not 'a harmonious remembrance' nor 'a musical memory.'

Le paysage chante avec le paysagiste is a charming phrase, to which few did justice. *Meliora's*: 'The scene varies with the feelings of the portrayer' is perhaps the best rendering.

As one competitor points out, the words *au revoir* and *adieu* need not be translated. Still there is no reason why the former should not be rendered by 'good night,' the latter by 'farewell.'

Though the number of competitors was very large, the quality of the versions was rather poor.

NOVEMBER PRIZE COMPETITION.

A Prize of One Guinea will be given for the best translation into English of the following extract:—

Le destin semble s'acharner contre une certaine classe d'hommes où il trouve ses victimes préférées. Celles-ci du reste s'y prêtent et semblent s'offrir au désastre.

On comprend qu'il s'agit ici des hommes politiques qui, tous ou presque tous, abusés sur leur propre valeur, attribuent à l'influence d'une mauvaise étoile le résultat logique de leurs conceptions erronées. Le dégoût de leur existence manquée se trahit par des lamentations qui nous paraissent fastidieuses, car nous le connaissons, ce vieux refrain de la déconvenue, nos oreilles en sont lasses. C'est le *De Profundis* des espérances et le *Miserere* de l'ambition désenchantée; c'est le rabâchage de la médiocrité qui se croit un génie. Malgré tout ce que l'on peut leur reprocher, ces hommes m'inspirent de la commisération; ils ont souffert, ils n'ont vécu que d'illusions et sont tombés parce qu'ils n'avaient point le lest intellectuel qui assure l'équilibre. Ils geignent, ils se dépitent et, plus qu'il ne conviendrait, font rire à leurs dépens. J'avoue que je les plains, mais je n'en puis parler qu'avec maussaderie, tant la route qu'ils suivent nécessairement s'éloigne de celle que tracent la morale et la probité: car ne pas dire ce que l'on fait, ne pas faire ce que l'on dit, considérer une promesse pour parole vaine, c'est en politique un usage qui n'empêche pas, dit-on d'être galant homme.

Maxime Du Camp.

N.B.—Do not translate the Latin expressions into English.

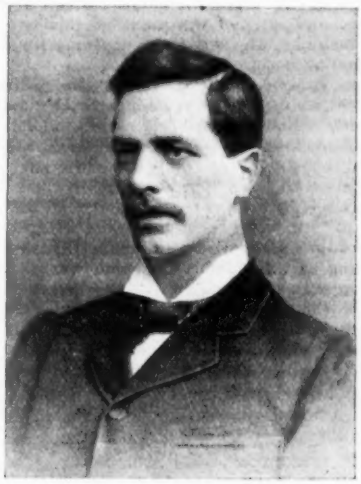
RULES.

1. All translations should be posted not later than November 10, and addressed:—*Prize Editor*, Office of The Practical Teacher, 33, Paternoster Row, London, E.C.
2. Competitors should cut out, and send the Coupon which appears on the Back Wrapper page of the current number.
3. Competitors should adopt a pseudonym, and send name and address written on a separate piece of paper.
4. Teachers specially employed in teaching modern languages are not eligible as prize-winners.

THE CLASS TEACHERS' COLUMN.

BY C. H. MOORE,
Executive, N.U.T.; Ex-President National Federation of Assistant Teachers, &c.

By the time these lines reach my readers, the London Conference of the National Federation will have been held. Certain changes will have been made in the constitution of the



MR. W. H. TOTTERDILL.

Federal Committee. Chief among these will be the unopposed election of Mr. W. H. Totterdill to the Vice-Presidency of the Federation. In thus unanimously selecting Mr. Totterdill for this honourable position, the Federation is doing honour to itself as well as recognising the claims of one of the most valued and untiring workers the organisation has known. Mr. Totterdill has been the secretary of the Federation since its establishment. Of his work in that capacity it is impossible to speak in anything like adequate terms. Under his management the Federation has attained its present position, and that is perhaps the highest testimony any person can pay to Mr. Totterdill's ability. With regard to his future position in the Federation, one cannot but look to the realisation of many of those educational aims which he has long had in view, and to an increased development of influence and strength under his direction. Like many other prominent educationists, Mr. Totterdill hails from Bristol. And Bristol is the only town in which the scale of remuneration laid down by the Federation has been realised.

* * * * *

MR. TOTTERDILL'S loss as secretary to the Federation would have been irreparable but for the advent of Mr. Dugdale, the new secretary. To appreciate the valuable work of Mr. Dugdale one should visit the Manchester Class Teachers. In the organisation of the Class Teachers' Associations of Lancashire, Mr. Dugdale has already done incalculable service for the Federation. An ardent enthusiast, an energetic worker, and a gentleman of scholarly ability, Mr. Dugdale comes into office with a future before him, and with a prospect of earning the everlasting gratitude of his colleagues for the splendid work which it is sure he will perform. I congratulate the Federation on its selection of two most valuable officers, and I felicitate the two gentlemen on the unanimity with which they have been accorded their well-deserved and honourable positions.

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TRULY the position of the qualified Class Teacher is being to some extent recognised. At the last meeting of the Executive of the N.U.T., a resolution was adopted asking that all entries made in Log Books respecting the qualified Class Teachers on the staff should be shown at the time of entry to the teachers concerned. This is a perfectly reasonable requirement. I know of more than one case where the entries in the Log Book have been the means of seriously injuring the professional position of the Class Teacher, and the teacher has all the time been unaware of the existence of the damaging secret evidence. I have never been able to see why such a record as a Log Book renders possible should be permissible when reflecting upon the position of a practitioner as well qualified, technically, as the one who considers it to be his or her duty to make such record. I believe, however, that the prevalence of secret reports is rapidly diminishing, and I feel sure that the Conference of the N.U.T. will endorse the Executive's opinion respecting the necessity for perfect openness in matters of this kind.

* * * * *

ANOTHER matter on which I should like to be informed, which concerns the professional freedom of the Class Teacher, is the subject of Staff Conferences. The inspectors are now requested to hold conferences with the staff of the schools, and consult and advise the teachers on the requirements of the school. I feel that the greatest advantage of this system is not being attained. In all well-regulated schools, the qualified members of the staff are afforded an opportunity of expressing their opinions on the condition of the school, and on the best means to be adopted for the maintenance or development of the well-being of the establishment. This method is not, however, as prevalent as it might be, and an extension of the system, besides adding to the benefit of the schools concerned, also aids to establish that position which must be assured for the permanent Class Teacher now at work in the schools. It follows, therefore, that any criticism which may be offered on the work of a school should be made at such a time as will permit of all who are directly responsible for the reputation of the school being able to discuss such criticism freely. If, therefore, any of my colleagues can assist me by information respecting such Staff Conferences as they are acquainted with, I should be grateful for the knowledge afforded.

* * * * *

ONE more matter of inquiry. The development of the system of intermittent inspection in place of annual examination is extremely interesting from the Class Teacher's point of view. In the schools which I have visited, and in conversation with the many teachers whom I meet, I have endeavoured to ascertain what new methods of organisation the new system has entailed. In the great majority of cases which have come under my notice, I have found that greater freedom has been extended to the Class Teacher in his methods of teaching. I regret that in many instances I have discovered the perpetuation of the examination craze. What educational end the principal teacher of a school can have in view when he finds it necessary to hold a stereotyped examination of all subjects once a month, and even weekly, passes my comprehension. If we are to have the true development of educative effort, we must not bind the teacher to the accomplishment of certain defined portions of codified syllabuses; the Class Teacher's standing must not be regulated by reports on his or her ability to secure certain uneducational results in a specified time by competition with his or her colleagues in school. This is but a perpetuation of the pernicious system against which the teachers, through their union, have long been contending. A few experiences under the new order of things would be of great service to me, and I shall be obliged if any of my readers think it worth while to communicate with me on the points I have raised.

* * * * *

I MADE a comment last month on the demise of the Liverpool and Cleveland Class Teachers' Associations. Since that time I have received information respecting both these organisations. And, first, with regard to Liverpool. As far as I can see, the Class Teachers of this city have not seriously considered the position before agreeing to the dissolution of their organisation. The need for active effort on the part of Class Teachers, as such, was never so great as at the present time. The late Education Bill demonstrated the need for cohesion.

SUPPLEMENT PRESENTED WITH THIS NUMBER.

The forthcoming Bill may render the necessity all the more pressing. Under the circumstances, I suggest that our Liverpool friends might well reconsider their position. With regard to Cleveland, I am afraid that the Association has died from sheer apathy. Well, the Cleveland district must be the Elysium to which all Class Teachers should aspire, but, personally, I regret that I cannot share that view. There was a time when great things were expected from the Cleveland Association. If the conditions affecting the Class Teachers in the district are all that can be desired, there still remains the need to put forward every effort to bring the position of more unfortunate colleagues throughout the country to the same level. Come, Liverpool—come, Cleveland. Let us shake hands with your representatives at the next Conference of the Federation.

* * * * *

An attempt has been made to establish a branch of the Federation at Birkenhead. The apathy of the teachers in the locality almost disheartened the promoters of the project. I understand that another effort is to be made. Will the Birkenhead Class Teachers lag behind their brethren? I trow not. I should esteem the honour of being able to propose the affiliation of the newly-formed Birkenhead Association to the Federal Committee.

'COMPOSITION THEMES AND MORAL TRAINING.'

A SERIES OF LESSONS PREPARED ON A NEW PLAN FOR THE UPPER STANDARDS.

BY B. ELDERKIN,
Model School, Westminster College.

☞ THE LESSONS FULLY MEET THE LATEST INSTRUCTIONS IN THE NEW CODE, 1896.

See Introductory Notice in April number.

Hints for successful use of these lessons:—

a. The subject matter may be *read* over by the teacher or even by one of the scholars, or, better still, the teacher may previously read it and give the substance to the class in his own words. He may thus at discretion introduce other illustrations or omit some of those given.

b. The blackboard summary may be put before the class if the teacher is short of time, or, what is much better, a similar one may be made up while the class is being questioned on the matter of the lesson.

c. The whole of the essay should be put before the class at the first lesson, but it will often happen that there will be sufficient matter for two or more written exercises.

d. It is not intended that these lessons should be used exclusively, but that they should form a part of every month's Composition work.

e. Keep the best exercises, so that the Inspector may see the plan upon which they have been worked, as well as the topics written upon, or have a separate exercise book for Composition.

LESSON VI.—COURAGE.

1. Courage, even where it is misplaced, seldom fails to excite our admiration, but where it is associated with duty or useful and honourable service, it invariably raises its possessor to the highest degree of public esteem.

The soldier, the sailor, the explorer, the doctor, has each in turn had more than an ordinary share of danger and difficulty, and each one has left his story on the pages of fame to a far greater extent than others whose work in the world has demanded of them but little of personal heroism.

2. Happily the British race has always been greatly distinguished for its bravery, and this is one of the main reasons why our country, geographically so small, has come to occupy a foremost place among the nations of the world. The Army and Navy perhaps afford the best field for the study of courage, but it must not be forgotten that unless this were a characteristic of the race generally, it would not be possible to produce an army or navy composed of men ready to face any and every danger at the call of duty.

3. We are apt to think too much of the brave deeds and exploits of great generals and admirals, and in this way to do injustice to the rank and file who have the lion's share of the real work and perils of warfare; but this is perhaps the fault of the historian, who is often obliged to make the name of the leader do duty for the whole army.

4. As an illustration of how our countrymen dislike anything but a fair fight, we may mention an incident in the life of Lord Lake. A certain French fortress, lying in the Douab between the River Ganges and the Jumna, had to be taken. Lord Lake was entrusted with the command of the attacking force, and he conceived the idea of saving British treasure and the lives of his troops by bribing the native defenders to surrender the fortress to him. He knew they were already hired into the service of the enemy, and he thought British gold might be as tempting as any other. The plan was successful, but Lake's action was not popular with his fellow-countrymen, because, however humane his motives may have been, there was an *appearance of cowardice* about it, and Lord Lake's reputation suffered in consequence.

5. Fighting is at all times a fearful thing, and yet no profession is more highly esteemed than the soldier's, for the reason that courage, carried to the point of self-sacrifice, redeems it from every taint of dishonour.

A few striking examples will be sufficient to show the stuff of which British soldiers are made.

(*a*) In 1860 a united British and French army was engaged in attacking the famous Taku Forts in China. The task was no easy one, and there was a healthy rivalry as to whether the British or French ensign should be first to plant a flag on the walls of the Fort. The British ensign, Fraser, was shot down with his flag in his hand. The flag was seized by Ensign Chaplin, who, with flag in one hand and sword in the other, called on his companions to support him as he pushed forward. He had scarcely given the word 'Advance,' when he was shot through the arm. He refused to leave his post, bound up the wounded arm himself, and led the way over a dangerous moat across which a crazy bridge had been made by scaling ladders. Having thus gained the walls, Chaplin was shot a second time, but nothing could induce him to leave his post or have his wounds dressed. The Chinese fought with great determination, pushing back the scaling ladders and shooting and hurling stones upon all who attempted to climb the walls. There was little to choose between the British and French positions, but young Chaplin, who must have been suffering terribly with both arms shot through, made a last desperate attempt, in which he was quite successful; though in the moment of waving his flag from the summit of the wall he was shot through the leg and had to be carried to the rear. Chaplin lived to receive the Victoria Cross for his conspicuous bravery.

(*b*) Many of the best and bravest of both officers and men have belonged to the Irish regiments, and an incident from the Siege of Athlone will show how bravely the Irish can fight. William, Prince of Orange, was directing the siege, and the town was almost reduced to ruins, but it could not be taken until the River Shannon was successfully crossed. One arch of Queen Elizabeth's Bridge over the river had been destroyed, and it was only by spanning that arch that access could be got to the town. Under the protection of a heavy fire from the English the bridge was spanned by beams and planks, and part of the English army had successfully passed over. The brave Irish burned and destroyed the temporary bridge. Again the English made a spanning platform, and again it must be destroyed or the town would be captured. A sergeant of Dragoons asked for ten volunteers who would die with him to save Ireland. There were plenty of volunteers, but ten only were selected, and they set out with no weapon save their

axes. The English could not at first make out their intention, but the men made straight for the bridge and at once commenced to hew and hack the offending platform. The English were dumb with amazement at their coolness and courage, but seeing the Irish meant business they opened fire and in a few minutes the dead bodies of the men were floating down the stream. A second relay of men instantly took their places. Fast went shot and ball and fast flew their axes at the offending bridge. Nine of these brave fellows met the same sad fate as their predecessors, but the remaining two stuck to their dangerous post until they were able to return with the joyful tidings that the bridge was hopelessly destroyed and the city saved.

(*c*) One of the noblest instances of heroism occurred in connection with the American War. The River St. Laurence was frozen over, and Major McDonnell and Captain Jenkins crossed over it on the ice in the teeth of a blinding snow storm with a mere handful of men to attempt the capture of an American fort. They divided their little force into two companies so as to be able to attack from opposite sides. The movement was discovered, and Captain Jenkins had his left arm shot away by one of the enemy's guns.

He fell into the drifted snow, but in a second or two he was up and leading his men once more. Almost immediately after, his other arm was shattered by another shot. He was implored to desist, but he saw that his comrades were hard pressed, and that unless he could relieve them by diverting the attack upon himself they would be cut off. He manfully called on his men to advance, but after proceeding twenty or thirty yards he fell helpless in the snow. Two of his comrades carried him out of danger, and he happily survived to a good old age. His conduct is deserving of the more praise because, as he was not a regular officer of the army, it was not possible to reward his brave conduct with such promotion or decorations as it deserved.

6. Not alone amid the horrors of warfare do we meet with examples of conspicuous courage. Our sailors, who have to brave the terrible dangers of the deep; the gallant lifeboat-men who go out with their lives in their hands to the rescue of their fellow men; the firemen and the police, as well as thousands of workers in mines, factories, and foundries, are compelled to pursue their calling in the face of constant peril.

7. To be a coward is to bring upon ourselves and to deserve the contempt of our fellows. If a nation ceases to be brave, it soon ceases to be great and free. Boys and girls should seek to foster courage. They will need it not only in facing the constant dangers of life, but most of all in choosing right conduct.

8. To *know* right is not to be safe and good. We need to have the courage of our own opinions and *do* right whatever others may do, or whatever may be our own special temptations.

England wants brave and noble sons, because all the posts of honour and danger which are now held by *fathers* will soon be occupied by their children. Happily there are no signs at present of a decay of courage, but the day will come to us, both as individuals and as a nation, when, if we are found wanting, others more worthy than ourselves will step into our position.

Blackboard Summary.

COURAGE.

1. Those pursuits are most highly esteemed which demand courage.
2. What part courage has played in making England a great nation.
3. Courage in the British army: conspicuous both in officers and the rank and file.
4. Why Lord Lake lost prestige.
5. Examples of conspicuous courage.
   - (*a*) The British and French ensigns in China.
   - (*b*) The Siege of Athlone and bravery of the Irish.
   - (*c*) Major McDonnell and Captain Jenkins in the American War.
6. Examples of courage in other walks of life.
7. The fruits of cowardice.
8. Why courage is required from everyone.

MODEL ANSWERS TO QUEEN'S SCHOLARSHIP QUESTIONS.

HISTORY.

MEN AND WOMEN.

Tuesday, December 17th—4 to 5.30.

Candidates may not answer more than *four* questions.

If you answer more than *four* questions, only the *four* answers coming first on your paper will be revised.

1. The tyranny of King John combined for the first time the Barons, Clergy, and people against the Crown. Show from the provisions of Magna Charta the main privileges which each party sought to establish?

By Magna Charta:—

(*a*) The Barons obtained—

(1) Freedom of succession. The King undertook to demand no unreasonable dues when a son succeeded to his paternal estates.

(2) Protection of the estates of minors.

(3) Protection of wards and widows. The King agreed not to compel the latter to marry against their will, nor the former to enter into a disparaging marriage.

(*b*) The Clergy obtained concessions that mainly meant full liberty to choose their own prelates.

(*c*) The people obtained—

(1) The assurance that the person and property of every freeman are absolutely secure from every kind of damaging process, 'save through the lawful judgment of his peers or the law of the land.'

(2) Prompt justice, free from the influence of bribery.

(3) Limitations of exactions of overlords.

(4) That the consent of the Common Council of the realm should be necessary before the King could demand any scutage or aid (except for ransoming his person, making his eldest son a knight, or marrying his eldest daughter).

(5) Mitigation of forest laws.

(6) Confirmation of their ancient franchises to the towns.

(7) Liberty of travel.

(8) That the Courts of Common Pleas should be held in fixed places.

2. What is meant by the following:—The Great Council, Scutage, the Jewry, Papal Provisions, Benevolences, Maintenance and Livery?

The Great Council of the Norman reign was, in most respects, a continuation of the Witenagemot. By the time of Henry II. it had become a mere feudal assembly of tenants-in-chief, and from this time to that of the calling of the First Parliament it continued to be an assembly of landholders. Its power varied with the character of the King. Its formal consent was generally given to legislative Acts, and it sometimes even resisted the Royal Will.

Scutage.—Under the Feudal system land was held on condition that the tenant should render military service when required. In the time of Henry II. knights were allowed to make a payment instead. 'Scutage,' therefore, meant a payment in commutation of service. John, however, by extending its meaning, made it a means of extortion, and therefore its exaction was limited by Magna Charta.

The Jewry was that quarter of the old English towns which was inhabited by the Jews. In London it was in the neighbourhood of the Tower.

Papal Provisions.—From the beginning of the 13th century, the Popes claimed the right of bestowing livings in the Church according to their own will, and this in opposition to the rights of patrons. Interference under this claim obtained the name of 'Provisions,' and was forbidden by the Statute of Provisors, 1350, 1364, 1390.

Benevolences were at first free gifts, sometimes expected and even solicited, from the people to the king; afterwards the term included loans. These free gifts and loans were often enforced by summons before the Privy Council, especially under Henry VIII.

Maintenance was the support given to the plaintiff in any legal proceeding by some powerful person who had no personal interest in the case. It often amounted to an attempt to overawe the court. In return for such help, the person assisted became the dependent of the baron or lord who maintained his cause, and wore his *livery*. Great lords were very lavish in

SUPPLEMENT PRESENTED WITH THIS NUMBER.

the distribution of their liveries, the wearing of which was considered a pledge of the giver's assistance. Associations were also formed for mutual maintenance. In spite of a long series of enactments, beginning from 1275, the practice was not suppressed till 1488.

3. By what means did Henry VII. seek to make the power of the Crown supreme? How did the circumstances of the time favour his object?

The object of Henry VII.'s policy was to render the power of the Crown supreme. To accomplish this—

(1) He reconciled the Yorkist party by marrying the Princess Elizabeth, daughter of Edward IV., whom he caused to be crowned in November 1487.

(2) He repressed the two rebellions of his reign with great severity, especially punishing those rebels who from their position or possessions were likely to be dangerous.

(4) He broke the power of the Barons. For this purpose he established the court of the Star Chamber, which was to deal with offences which were not covered by the law, especially with 'Maintenance.' He thus deprived the nobles of their retainers.

(4) He rendered the Parliament subservient to his will.

(5) He made the Church dependent on himself.

(6) By means of 'benevolences,' fines, and treaties, he contrived to render himself independent of Parliament, which he only summoned seven times altogether, and only once during the last thirteen years of his reign.

(7) By advantageous commercial treaties he conciliated the trading classes.

He was helped in these aims by the fact that the Yorkists had now no active leader (1), and that there was a general desire for peace (2). The baronage had become almost extinct during the Civil War, and in the Parliament of 1485 there were only 29 peers, some of them new creations. By raising a new class of officials also, he rendered himself independent of the peers as ministers, and bound the ministers entirely to himself (3). The Commons, accustomed as they were to look to the greater lords to lead the opposition, and not being strong enough to stand by themselves, lapsed into subserviency (4). The Clergy having lost the affections of the people, and being disorganised through Papal interference, sought the patronage of the King, which he gave in such a way as to retain them as willing supporters of his power (5).

4. What great religious movements took place in the reigns of Henry III. and Edward III.? Describe *one* of them, showing against what evils the movement was aimed and what its effect was.

The reign of Henry III. (1216–1272) was characterised by the commencement of a reaction against Papal interference with English affairs, which had culminated in the interdict of 1208 and the pretended deposition of John by the Pope. The most prominent figure in the religious history of the reign was Robert Grossetête, Bishop of Lincoln (1235–1253). He brought to his diocese a burning zeal for reform in administration and discipline. Believing that the duty of the Church was to care for the souls of the people, he visited every parish and cloister under his care, removing unworthy priests and purifying the monasteries. He insisted on the priestly duty of preaching, and gave instructions to those priests who required it. To supply the lack of preachers, he introduced and pushed forward the two new mendicant orders, as then uncorrupted. He strenuously opposed absenteeism, enforcing residence and active duty on the part of every incumbent. He even refused to install the Pope's nephew when the latter was appointed a canon of Lincoln Cathedral.

Grossetête, however, with all his zeal and piety, attempted no alteration in doctrine. He succeeded in rousing some other prelates from their indifference, and influenced the Church of England for good for the remainder of the century.

The great religious movement of Edward III.'s reign was led by John Wycliffe (1324?–1384). A brilliant scholar, he had been led by the study of the scriptures to regard the Papal interference in English affairs as contrary to Divine law and the rights of the English people. When the Pope demanded the tribute promised by John in 1211, together with the arrears of the past 33 years, it was Wycliffe who furnished the King with a formal reason for refusing it. He followed this up by attacking various abuses in the Church, and especially the corruption of the Papal court. Finally, in 1377, he threw off all allegiance to Rome, declaring that the Pope was Antichrist. Wycliffe taught that the Scriptures were the sole authority of doctrine and faith. To propagate these opinions he sent out poor preachers, who taught in the parish churches where possible, or in the churchyard or market place—in fact, wherever people would listen. He followed this up by translating the whole of the Bible into English (finished 1382, revised 1388).

In doctrine he carried his ideas of reform quite as far as the Protestant reformers of the 17th century, and went beyond them in condemning all Church property and endowments as unscriptural and dangerous to the spirituality of the Church.

The teaching of Wycliffe did much to rouse independence in Englishmen and purity in the Church. The efforts of the Poor Preachers gave new moral life to the poor, and the translation of the Scriptures was very influential in fixing a literary form upon the language. The Rebellion of 1381, though attributed by the bishops directly to Wycliffe, was probably only very indirectly due to his teaching. The effects of the Reformation of Wycliffe were largely obliterated by the ensuing persecution and by the civil broils of the 14th century.

5. Give the dates, contending parties, and *political* results of the following battles:—Tenchebrai, Bouvines, the Siege of Orleans, Barnet, Pinkie Cleuch.

Tenchebrai.—Sept. 28, 1106. Fought between Henry I. and his brother Robert. Henry was victorious, Robert was imprisoned, and Normandy became a possession of the English crown.

Bouvines.—July 1214. English, Germans, and Flemings on one side against the French. The French were completely victorious. The result consummated the separation of England and Normandy, and, by depriving John of all hopes of being able to rely on his Continental dominions, went far towards compelling him to submit to the demands of the Barons, and hence made Magna Charta possible.

The Siege of Orleans.—1428–9. The town was besieged by the English under the Duke of Bedford. The French, roused by Joan of Arc, succeeded in raising the siege. This event marked the turning point of the English victories in France, and began that series of disasters which resulted in the loss of all the English possessions in France except Calais.

Barnet.—April 14th, 1471. Was fought by Edward IV. and the Yorkists against the Earl of Warwick and the Lancastrians. Warwick was defeated and slain. This battle, the last in the Wars of the Roses, completed the overthrow of the Lancastrian party, and established the sovereignty of Edward IV.

Pinkie Cleuch.—Sept. 10, 1547. The Protector Somerset invaded Scotland with the object of compelling the Scots to agree to the marriage of Mary to Edward VI. Though victorious in this battle he did not succeed in his object, for the Scots immediately sent Mary away to France. The political results, therefore, of this battle were *nil*.

(*To be continued.*)

ARTIFICIAL SILK.—Lustro-cellulose, an artificial silk prepared from cotton, from the researches of C. F. Cross and E. J. Bevan, is found to involve no possible risk from explosion or excessive inflammability. Its preparation takes place thus: first, the cotton is nitrated and dissolved in ether and alcohol; then the viscous solution of cellulose nitrate is drawn through fine orifices of glass and precipitated by water, or solidified by evaporation of the solvent; the process being continuous so that a fine thread is formed; then the threads having been thrown or twisted together to form the compound thread or textile yarn, this is next denitrated. The resulting cellulose thread retains its form and lustre, and forms the artificial silk known in commerce as lustro-cellulose.

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WINTER STARCH.—In a recent number of the *Botanisches Centralblatt*, Herr Rosenberg states that an increase of starch takes place during the winter in the perennial parts of many perennials, *e.g.*, *Scrophularia nodosa* and *Spiræa ulmaria*. This has already been shown to be the case in many woody plants. The increase cannot be said to be directly due to assimilation, since the leaves are then entirely wanting, and the buds inactive. Herr Rosenberg found that the amount of starch in the various parts of the rhizome in these plants varied greatly from month to month. In other plants he experimented upon, *e.g.*, *Potentilla argentea*, *Plantago major*, and *Hepatica triloba*, the amount of starch in the underground organs was found either to decrease or entirely disappear between November and April.

'THE JOKE AS AN EDUCATIONAL INSTRUMENT' will be the title of the Paper, to appear in our next issue, by J. Adams, M.A., B.Sc., Rector Free Church Training College, Aberdeen.

Our Science Section.

Subscribers requiring Explanations of Difficulties in any Branch of Science, or Advice upon Courses of Study, can obtain all help required by communicating with the Editor, and accompanying their query with the Coupon cut from this No.

CHEMISTRY NOTES.

BY THOMAS CARTWRIGHT, B.A., B.SC. (LOND.),

First Class Honoursman in Chemistry (Science and Art Department), Head Master, Finchley Organised Science School, and Lecturer therein on Chemistry.

The History of Chlorine.—All students, Elementary, Advanced, and Honours, should by no means omit to read the address upon chlorine given by Dr. Ludwig Mond to the Chemical Section of the British Association, of which Dr. Mond was the chairman. Starting with the Arabian alchemist Geber, and passing on to Scheele, the speaker, in a masterly manner, ran through the gamut of improvements in the manufacture of the important element with which the venue of this year's meeting, viz. Liverpool, is so honourably connected, producing now, as Dr. Mond stated, no less than two-thirds of the chlorine of the whole world. The part played by Weldon, Solvay, Dunlop, and Deacon, in the building up of this all-important industry was told in a masterly manner by Dr. Mond, his address constituting one of the finest examples of historical chemistry that can be imagined. The address is reproduced in Nos. 1922, 1923, of the *Chemical News*, which were the numbers for September 25 and October 2 respectively.

A New Element.—In monazite sand M. P. Barrière has found a new element—**Lucium**. It has been examined by eminent chemists, and is credited with the following properties: It is soluble in sulphuric, hydrochloric, and acetic acids, and in water. With the acids it forms salts, either white or slightly rose-coloured. Its atomic weight is 104.

Determination of H_2SO_4 or of Ba.—In the *Chemical News* for the 17th of October, Dr. Edmunds gives particulars of a neat way of speedily determining the amount of H_2SO_4 in a solution containing only a small quantity of a sulphate, such as 70 cc. of sulphatic water. His scheme is as follows:—'The SO_3 to be measured is prepared with $Ba(NO_3)_2$ in excess; the residual Ba is prepared by K_2CrO_4 in excess; the residual chromate is prepared with $AgNO_3$ in excess. The mixture is filtered off. An aliquot part of the filtrate is titrated for its residual $AgNO_3$, K_2CrO_4 being used as an indicator. The total of the residual $AgNO_3$ deducted from the $AgNO_3$ originally used, gives the equivalent of the SO_3.'

'In determining Ba, 70 cc. of its solution is shaken with 10 cc. of $\frac{N}{10}$ (decinormal) solution of K_2SO_4. The residual SO_3 is then determined by the procedure above described. The 70 cc. must contain less Ba than is equivalent to the SO_3 in the 10 cc. of K_2SO_4, and it must be free from substances—such as Sr or Pb—which would precipitate SO_3 otherwise than as $BaSO_4$.'

Valuation and standardising of solution of permanganate.—The preparation of a solution which will not vary in composition upon keeping, and with which one may readily determine the strength of permanganate solution, will be very welcome both to Advanced and to Honours Students. Professor Reigler supplies directions for such a solution as follows:—'I prepared such a solution by dissolving 9·9654 grms. of chemically pure crystallisable oxalic acid in about 500 cc. of water, adding 50 cc. of concentrated H_2SO_4, allowing the mixture to cool, and making up with distilled water to exactly 1 litre.'

'Each cc. of this solution corresponds exactly to ·005 grms. of $KMnO_4$.

$$5C_2H_2O_4.2H_2O + 2KMnO_4 + 3H_2SO_4 = 10CO_2 + K_2SO_4 + 2MnSO_4 + 18H_2O.$$

'In order to determine the standard of a solution of $KMnO_4$, we pour from a burette into a small flask exactly 20 cc. of the above solution of oxalic acid heated to ebullition, and gradually add (with agitation), from another burette, the $KMnO_4$ solution in question, until the last drop produces a permanent rose coloration.

'If there were consumed 25 cc. of a solution $KMnO_4$, each cc. of this solution 4 grms. $KMnO_4$.'

Argon and Helium.—Herr Siegfried Friedländer publishes the following conclusions that he has arrived at respecting the above substances:—

(1) Argon reacts with Pt and also with Mg.

(2) Helium is present in very minute quantities in the atmosphere of Berlin, viz. in the proportion of 1 : 100 millions.

(3) Helium reacts with Pt on the prolonged action of electric discharges, also with Mg, and is possibly absorbed by Al.

It is remarkable that numerous argon lines lie very near to helium lines without being identical. From this similarity as to spectra is argued a similarity as to chemical behaviour. As Large and Vaschen have shown that helium is not an element, but a mixture of two substances, it is probable that argon is not an element, but a mixture of probably two elements. If an element, argon must be monatomic with an atomic weight of 40. But an element of this atomic weight can have no place in the periodic system. Thus, we must either reject the results of the kinetic theory of gases, or overturn the periodic system. Or, if we assume argon to be a diatomic element with an atomic weight equal to its vapour density, with this atomic weight we should uphold the accuracy of the periodic system, but should sin against the kinetic theory of gases. The only remaining assumption is that argon is not an element.

Crookes has hitherto pointed to the compound nature of argon from his spectroscopic observations of both the blue and the red spectra of argon. It is difficult to separate the blue spectrum from the red, but in some circumstances the red spectrum does not change into the blue. I regard the fact that both spectra of argon appear simultaneously as one of the weightiest proofs that Lord Rayleigh and Professor Ramsay have revealed two new elements by their discovery of argon.

In the concluding words of Dr. Mond's address, to which we have just referred, the following reference to argon was made:—'A new form of matter represented by argon and helium, which, as their discoverers, Lord Rayleigh and Professor Ramsay, have now abundantly proved, are certainly elementary bodies, in so much as they cannot be split up further, but are not chemical elements, as they possess no chemical affinity and do not enter into combinations.'

Manufacture of $KClO_3$.

Cl is lead into a cream of ZnO and water: zinc oxychloride and hypochlorite are first formed; but, finally, a clear solution of zinc chloride and hypochlorite is obtained. The conversion of the hypochlorite into chlorate readily takes place when this solution is heated with the requisite quantity of KCl, and the yield is almost theoretical. A still better method is to add the KCl to the zinc oxide and water before the Cl is passed in, and then to keep the temperature at about 90–95° during chlorination. The resulting solution may be evaporated down, when on cooling the remainder of the $KClO_3$ crystallises out in nearly pure form.

NOTES ON PHYSIOLOGY:

EMBRACING THE SUBJECTS OF THE ADVANCED AND HONOURS STAGES, SCIENCE AND ART DEPARTMENT.

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THE DUCTLESS GLANDS.

These are the spleen, the thymus, the thyroid, and supra-renal glands.

The Spleen.

When a stream of normal salt solution is passed through the splenic artery, and as much blood is washed out of the spleen as possible, the organ then hardened in this condition and microscopic sections made, the following structure is exhibited :—

1. There is an external coat or *capsule*, which send inwards processes or *trabeculæ*, just as in a lymphatic gland, and these branch and unite with others to form a network. The spaces between contain the spleen-pulp. This pulp is made up of a very fine meshwork, which is filled with (1) lymph corpuscles. Also the spleen-pulp contains some (2) large white corpuscles, which appear to contain red corpuscles, sometimes almost in a natural condition, at other times the red corpuscles are disintegrated and appear as masses of brown granules. The pulp also contains (3) red corpuscles apparently normal. In the spleen of the young animal, nucleated cells coloured with hæmoglobin are to be seen, and the adult spleen, after a great loss of blood, also contains such nucleated red corpuscles.

2. It is difficult to inject the blood-vessels of the spleen. But, according to most histologists, the blood, after leaving the smaller arteries into which the splenic artery breaks up, passes through a series of channels in the pulp destitute of definite walls before it reaches the veins—in other words, there are no closed capillaries. In fact, the smallest arteries open out into the spleen-pulp, and the endothelial cells lining the smaller vessels become spindle-shaped instead of flat, and unite with the cells of the splenic reticulum. Scattered along the branches of the arteries are small oval structures called Malpighian bodies. The largest are $\frac{1}{10}''$ in diameter. They are small lymphatic nodules.

(1) *Extirpation.—Functions of the Spleen.*—It is related that, in former days, it was the custom to remove the spleen from kings' messengers in order to prevent the unpleasant stitch in the side felt during active movement after a meal. After food the spleen becomes larger, since its blood-vessels dilate. The above tradition may be true, since it is certainly the case that the normal spleen may be removed in animals with impunity, and no bad symptoms occur. But the remaining lymphatic glands and the bone marrow may then assume the functions of the spleen.

(2) From the *histological* character of the spleen-pulp, we infer that the spleen has something to do with the formation of the blood—either the destruction of effete, used-up red corpuscles, or the new formation of the same. A series of facts may be quoted in favour of both views. For instance, the oft-repeated observation and proof of the existence of large cells containing pigment granules, the accumulation of metabolic products (as leucin, tyrosin, uric acid) in the spleen, on the one hand, and, on the other, the large quantity of colourless and of coloured corpuscles still containing nuclei. It is, indeed, conceivable that both processes may proceed side by side.

(3) *Experimentation.*—With regard to the results of experiment on the organ, by virtue of the abundance of unstriped muscle which it contains the spleen suffers variation in volume; in fact, it has a pulse of its own. Like the kidney, it may be enclosed in a box containing warm oil, and the latter connected with a piston and lever to register changes of volume. The spleen undergoes a rhythmic contraction and relaxation about once per minute. Since these changes of volume occur after division of all nerves going to it, they are due to the muscular fibres themselves.

The Thyroid Gland.

The *thyroid gland* consists of two lobes, with a small bridge or isthmus connecting them. The interior of each lobe is made up of small glandular tubes completely closed. They are lined by a single layer of cubical cells. The cavity in each tube is filled with a clear fluid. In adults this fluid is replaced by a gelatinous or colloidal mass.

1. The thyroid gland has been considered to be a manufacturer of red and white corpuscles. This remains unproven.

2. In monkeys, extirpation of the gland is followed, after a few weeks, by an apathetic condition, by swelling of the skin of the face and abdomen, and the distension is due to the tissues becoming penetrated by a fluid which contains mucin. There is a disease called myxœdema, in which the body, face, hands, and feet become swollen. The expression of the face becomes stupid and heavy, the features coarse, and the mind a blank. The patient complains of no pain, she is feeble. In this disease there is atrophy or wasting of the thyroid.

The Thymus Gland.

The *thymus* consists of a number of lymphatic follicles held together by a framework of connective tissue. In the centre of the gland certain bodies are found, termed corpuscles of Hassall. Their function is unknown. The thymus is a lymphatic gland which manufactures white corpuscles. In man, it becomes much smaller soon after birth and ceases to have any importance. In hybernating animals the gland becomes filled with fat during the autumn.

The Supra-renal Capsules

consist of an outer or *cortical* and an inner or *medullary* layer. From the capsule trabeculæ enter the substance of the gland and divide the cortex into columns, in which the cells are imbedded. In the medulla there is a fine connective tissue and granular cells with large nuclei similar to ganglion cells of the nervous system.

We know next to nothing definite about their physiology. But, in Addison's disease, there are three cardinal symptoms, viz. :—

(1) Great debility.

(2) Pigmentation or bronzing of the face, neck, and hands, patches of pigment inside the cheeks and on the tongue.

(3) Sickness and vomiting. In Addison's disease the supra-renal bodies are enlarged, hard, and often filled with a cheesy material. The bacillus of tubercle has been sometimes found within these masses.

Their functions appear therefore :—

1. To be concerned with the destruction of useless pigments in the body. In Addison's disease the red corpuscles refuse to form rouleaux, and very often it is difficult to obtain a good clot from the blood of such patients. The cells of the cortex have been compared with those of the liver, and these are concerned in the removal and alteration of hæmoglobin.

2. The debility and sickness in Addison's disease is produced by irritation of the nerves of the solar plexus which supply the supra-renal capsules. Extirpation of the capsules seems generally to be fatal. It is certainly strange that in the case of the thyroid and supra-renals, no other structure in the body is capable of assuming their functions.

Discuss the share taken by the central nervous system in promoting sweating under various circumstances, as warmth, exercise, insufficient arterialisation of blood and the action of drugs. What evidence is there of the existence of nerves inhibitory of sweating? (Honours, 1893.)

Sweat is the product of the cells in the coiled portion of the sweat gland. The opinion sometimes expressed that sweat is a mere transudation from the plasma of the dermal papillary vessels is unacceptable, since the secretion of sweat is regulated by a special system of nerves, and is independent of the circulation. The sweat is alkaline, but may exhibit an acid reaction from contamination with the fatty acids from the oil of the sebaceous glands. It contains traces of sodium chloride, urea, etc.

As a general rule sweating is accompanied by dilation of the blood-vessels in the skin, but the two processes are quite independent. When the sciatic nerve of the cat is divided and the peripheral end of the divided nerve stimulated by the faradic current, drops of sweat appear on the soles. If the leg be amputated and the sciatic stimulated, sweat appears as before, and in this case the blood-vessels cannot dilate. Evidently there must be special nerves presiding over the secretion of sweat.

In fact, there appears to be nerve-centres for the secretion of sweat in the medulla oblongata and the spinal-cord. If the spinal-cord of a cat be divided in the upper dorsal region, and the animal left to recover, if asphyxia be then induced artificially, all the feet will sweat. If one sciatic nerve be divided previously, the sole of that foot does not sweat. So the action of the asphyxia must be upon the central nervous system. Exercise acts in a similar manner. During exercise the carbonic acid of the blood is increased, the oxygen diminished, and the changed condition of the blood stimulates the nerve-centres of the cord and medulla. Warmth acts similarly, and if the animal mentioned above is placed in a warm chamber, all the feet sweat, except the one in which the sciatic nerve is divided. By similar methods

of observation it has been shown that nicotin and acetate of ammonia act on the sweat-centres. Pilocarpin appears to act on the sweat-glands themselves.

In the horse, after division of the cervical sympathetic on one side, profuse sweating is apt to break out on the same side of the face. It has been suggested that this nerve conveys inhibitory impulses, in other words, is inhibitory of sweating to the head and face of its own side. But one result of the division of the cervical sympathetic is excessive dilatation of the blood-vessels of that side of the neck and face. This means that the sweat glands themselves are supplied with an abnormal quantity of blood. They are then more readily susceptible to slight irritation. This may explain the facts without the necessity of assuming the existence of special inhibitory sweat fibres.

In subsequent contributions a series of Model Answers to Advanced and Honours Questions will be given. The student should read Kirke's 'Handbook of Physiology,' the last edition of which is edited by Halliburton, and is just published. Foster's and Landor's are useful for reference. Professor Stirling's books on Practical Histology and Practical Physiology are useful and almost indispensable. They are published by Griffin.

(*To be continued.*)

MAGNETISM AND ELECTRICITY.

SCIENCE AND ART DEPARTMENT EXAMINATION IN MAGNETISM AND ELECTRICITY.—2ND STAGE.

BY EDWIN EDSER, A.R.C.S.,

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FRICTIONAL ELECTRICITY—*cont.*

9. An insulated sphere of 2 cm. radius is connected by a long thin wire with another insulated sphere, the radius of which is 6 cm., and which is surrounded by a third sphere of 8 cm. radius concentric with it. The wire which connects the first and second spheres passes through a small hole in the third so as not to touch it. All the spheres are conductors. Calculate the capacity of the two connected spheres.

Let Q_1 = charge on first sphere.

Then $\frac{Q_1}{2}$ = potential of first sphere.

Also, let Q_2 = charge on second sphere.

Then, if the third sphere be connected to earth, as I think is intended, there will be a charge of $-Q_2$ units on its surface.

Then potential of condenser formed by spheres 2 and 3

$$= \frac{Q_2}{6} - \frac{Q_2}{8} = Q_2 \times \frac{1}{24}.$$

Since the sphere and condenser are connected, their potentials must be equal.

To find their respective capacities, equate their potentials to unity.

$$\frac{Q_1}{2} = 1 \; ; \; \therefore \; Q_1 = 2.$$

$$\frac{Q_2}{24} = 1 \; ; \; \therefore \; Q_2 = 24.$$

The capacity of the system is equal to the sum of the capacities of its parts.

$$\therefore \text{ Total capacity} = 2 + 24 = 26.$$

Note.—If the third sphere is not connected to earth, and its thickness is not great, it will not affect the capacity of the enclosed sphere. We shall then have potential of second sphere $= \frac{Q_2}{6}$; $\therefore$ capacity of second sphere $= 6$; combined capacities $= 6 + 2 = 8$.

VOLTAIC ELECTRICITY.

10. Two cells, the E.M.F.'s of which are 2 : 1, are joined up in series with their E.M.F.'s acting in the same direction, and the circuit is completed through a tangent galvanometer, the needle of which is deflected through 60°. If one of the cells is reversed, no other change being made, what will be the deflection of the galvanometer?

Answer.—In a tangent galvanometer, the tangent of the angular deflection of the magnetic needle is proportional to the current. If C = current flowing through coils, and θ = angular deflection, we may write this

$$C = K \tan \theta,$$

where K is a constant at present undetermined.

Also, $C = \frac{E}{R}$, where E = E.M.F., and R = resistance in circuit.

Therefore, in first case,

$$\frac{3e}{R} = K \tan 60° = K \frac{\sqrt{3}}{2}, \quad (1)$$

where e = E.M.F. of weaker cell.

In second case, where cells oppose each other, total E.M.F. $= (2 - 1)e = e$. Let θ be the angular deflection of needle.

$$\text{Then } \frac{e}{R} = K \tan \theta. \quad (2)$$

Dividing (2) by (1) we get

$$\frac{1}{3} = \frac{2 \tan \theta}{\sqrt{3}} \; ; \; \therefore \; \tan \theta = \frac{1}{2\sqrt{3}}.$$

This determines the deflection θ of the galvanometer needle.

11. A current of 1 ampère flowing for one second through a resistance of 1 ohm produces 0·239 gram-centigrade units of heat. What current would have to flow for an hour through a resistance of 41·84 ohms in order that the heat produced might suffice to raise a kilogram of water from 0° C. to the boiling point?

Answer.—The number of units of heat produced is proportional to the work done in the circuit, *i.e.*, to C^2Rt,

where C = current flowing.
R = resistance in circuit.
t = time current is flowing.

The number of units of heat produced according to the problem $= 1000 \times 100 = 100{,}000$.

$$\therefore \; C^2 \times 41{\cdot}84 \times 3600 = K \times 100{,}000, \quad (1)$$

where K = a constant.

Also, from conditions of problem

$$1^2 \times 1 \times 1 = K \times {\cdot}239. \quad (2)$$

Dividing (1) by (2),

$$C^2 \times 41{\cdot}84 \times 3600 = \frac{100{,}000}{{\cdot}239}.$$

$$C^2 = \frac{100{,}000}{35999{\cdot}136} = \frac{100}{36} \text{ nearly.}$$

$$\therefore \; C = \sqrt{\frac{100}{36}} = \frac{10}{6} = 1{\cdot}\dot{6} \text{ ampères.}$$

The current required $= 1{\cdot}\dot{6}$ ampères.

12. A bar magnet is suspended on a stirrup by a string, and oscillates in a horizontal plane. How are the oscillations affected (if at all) when a thick non-magnetic metal-plate is placed horizontally beneath the needle so as to be close without touching it?

Answer.—When a magnet moves near a mass of metal or other conducting material currents will be induced in the metal owing to the variation of the number of lines of force passing through any particular portion of it.

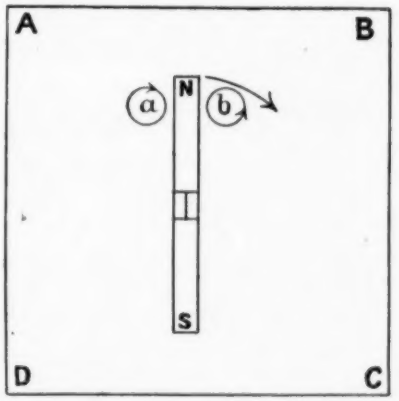

FIG. 5.

To examine how these induced currents will affect the motion of the magnet, let NS represent the magnet, supposed twisting in a clock-wise sense, above the slab of metal ABCD. Consider the effect of the variation of the number of lines of force through a small element a of the metal. A short time previously the N pole of the magnet was above a, and consequently lines of force were passing vertically downwards through

it. As N moved to the right, lines of force would be taken out of *a*, and consequently, by Faraday's law, an induced current will flow round *a* in the sense that the hands of a watch move. This will be equivalent to a south pole on the surface of *a*; and this will attract N. and tend to stop its motion.

Similarly, taking a small element *b* in advance of N, lines of force are being introduced into it, which create a current in a sense opposite to that of the motion of the hands of a clock. This current will be equivalent to a north pole placed at *b*, which will also tend to stop the motion of the magnet. The magnet will, therefore, be brought to rest more quickly than it otherwise would. The time of oscillation will be only slightly affected, unless the conducting metal is placed so near to the suspended magnet that the latter is brought to rest before completing a single oscillation.

13. A wire is stretched from east to west (magnetic). How, without breaking it, can you test whether, and in what direction, an electric current is passing through it?

Answer.—If a current be flowing through the wire, there will be circular lines of force around it. Also, a magnetic needle will tend to set itself with its N pole pointing along the lines of force.

Suppose a current to be flowing from west to east. Then looking along the wire in the direction in which the current is flowing, the lines of force will pass round it in the sense that the hands of a clock rotate. Therefore, below the wire, the lines of force will pass from south to north; a magnetic needle placed here would take up its ordinary direction. To the north of the wire the lines of force would pass vertically upwards; above the wire the lines would pass from north to south; whilst south of the wire they would pass vertically downwards. Therefore, above the wire the N pole of a magnetized sewing needle would point to the south, whilst to the north of the wire it would point upwards, and south of the wire vertically downwards.

14. Explain how the metals may be arranged in a thermo-electric series, and the conditions under which such a series has a definite meaning?

Answer.—If the junction of a strip of bismuth to a similar strip of antimony be heated, the other ends of each strip, whilst being kept at the same temperature, being connected through the coil of a low resistance galvanometer, the latter will indicate an electric current from bismuth to antimony across the heated junction. Seebeck found that a similar property applied to other metals, and that these might be arranged in a series, such that if the junction of any two metals was heated to a temperature greater than the rest of the circuit, the current would flow across the heated junction from the metal higher on the list to that which is lower.

\+ Bismuth.
Lead.
Copper.
Iron.
— Antimony.

In the above list, for instance, if a lead-iron junction be heated, the current generated will flow from the lead to the iron across the heated junction.

For the above series to have a definite meaning it is necessary, in the first place, that the metals should be pure; a slight trace of impurity often entirely altering the thermo-electric properties of the metal.

In the second place, it was found by Cumming that at a certain difference of temperature between the heated junction and the rest of the circuit, an inversion in the thermo-electric properties of the metals occurs. Thus if a copper-iron junction be slightly heated above the rest of the circuit, a current will flow from the copper to the iron, as indicated in the above series; but when the difference of temperature reaches 280° C. no current flows; whilst at a higher difference of temperature the current flows from iron to copper across the heated junction. Since this property is not confined to iron and copper, but extends to most of the other metals and alloys, it is necessary to know the neutral point of any pair of metals in the series in order to determine which metal will be positive for a given difference of temperature.

Books.—The Second Stage Examination questions largely consist of numerical examples of the simple electrical phenomena. For the purpose of familiarizing himself with these, the student should consult Stewart's 'Electricity and Magnetism' (University Correspondence College Publications), 'Elementary Lessons and Electricity and Magnetism,' S. P. Thompson (Macmillan & Co.). The student will also be incidentally referred to several treatises and original papers.

MATHEMATICS.

STAGES 2 AND 3, SCIENCE AND ART DEPARTMENT.

BY G. A. BAXANDALL,
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STAGE 2.

Algebra.

Example 20 (2), *October.*—The equation $3x + \sqrt{30x - 71} = 5$, after transposing and squaring, gives rise to the quadratic $3x^2 - 20x + 32 = 0$, from which we obtain $x = 4$ or $2\frac{2}{3}$. Now *either* of these values will, of course, satisfy the quadratic from which they were obtained, but *neither* will satisfy $3x + \sqrt{30x - 71} = 5$ if by $+\sqrt{30x - 71}$ is meant the *positive* square root of $30x - 71$, and by $-\sqrt{30x - 71}$ the *negative*. But the quadratic may also be obtained from $3x - \sqrt{30x - 71} = 5$, and it is this equation which the values 4 and $2\frac{2}{3}$ satisfy.

If, however, we suppose $\sqrt{30x - 71}$ stands for *either* the positive or negative square root of $30x - 71$, then we may say that the values 4 and $2\frac{2}{3}$ *do* satisfy $3x + \sqrt{30x - 71} = 5$ by taking the negative root.

Work the following examples:—

24. Each one of a family sends a Christmas card to all the rest, and, in consequence of this, the postman brought 182 letters on Christmas Day; how many were there in the family?

Ans. 14.

25. A plantation contains 10,000 trees planted in rows; if there had been 20 rows fewer there would have been 25 more trees in each row. How many rows were there?

Ans. 100.

26. A starts to walk from P to Q, a distance of 1 mile, while B starts simultaneously to run from Q to P and back. If B's speed be $2\frac{1}{2}$ times that of A, where will A be overtaken?

Ans. $\frac{1}{3}$ mile from Q.

27. ABCD and PQRS are two rectangles of which the longer sides are AB and PQ. AC is longer than PQ by 100 feet, and PR is longer than AB by the same amount. BC is fifteen times and QR twenty times as long as the difference between AC and PR. Find the dimensions of the rectangles.

28. The product of two numbers added to their sum is 23; and 5 times their sum taken from the sum of their squares leaves 8. Required the numbers.

Ans. 7 and 2.

Trigonometry.

Read Chap. XVII. H.S., *or* Arts. 228 and 229 in 'Lock,' and work examples from the sets xlix., l., and li. in H.S. or LX. and LXI. 'Lock.'

Also work the following, in which the necessary logarithms are to be taken from a book of tables unless they are given:—

42. Solve the triangle ABC when C = 90°, A = 18° 14′, AB = 432.

Ans. B = 71° 46′; BC = 135·167; AC = 410·31.

43. Solve the triangle ABC when C = 90°, AC = 423, BC = 584.

Ans. A = 54° 5′ 1″; B = 35° 54′ 59″; AB = 721·1.

44. A river PQ is 300 yards broad, and it runs at the foot of a vertical cliff QR, which subtends at the edge of the opposite bank an angle QPR of 25° 10′. Find the height of the cliff, having given L tan 64° 50′ = 10·3280372, log 3 = ·4771213, log 1·4095 = ·1490651, log 1·4096 = ·1490959.

Ans. 140·95617 yards.

45. The angle of elevation of the top of a tower rising out of a horizontal plane has $\frac{3}{8}$ for its cotangent at a point A in the plane. AB (= 32 feet) is drawn in the plane at right angles to the line joining A to the base of the tower; and the angle of elevation of the top of the latter is observed at B to be one whose cotangent is $\frac{1}{3}$. Find the height of the tower.

Ans. 60 yards.

46. A thin triangular plate ABC is in the shape of an isosceles right-angled triangle, and rests with BC on the ground and AC vertical, each of these sides being 20 units in length.

The triangle is now made to turn about AC until B comes to B′, where the angle BCB′ is 30°. Find the lengths of (1) the arc of BB′, (2) the chord BB′. Find also the sine of half the angle BAB′, and hence obtain the angles of the triangle BAB′ to the nearest minute.

Ans. 10·47 ; 10·35 ; ·183 ; 21°·6 ; 79°·27.

Euclid.

1. Given a circle and a point P within it, show how to draw through P a chord QPR, such that QP is one-third of QR. For what positions of P could no such chord be drawn?

2. From a point P outside a given circle the line PAB is drawn, passing through the centre and cutting the circumference in A and B ; also the line PQR is drawn, cutting the circumference in Q and R ; draw PC at right angles to PA to meet BQ produced in C, and join CA, AR ; show that the angle PAC equals the angle BAR.

STAGE 3.

Algebra.

Solution to Ex. 37 (*October*).—If x^2+5x+4 and x^2+mx+n have a common factor, then the equations $x^2+5x+4=0$ and $x^2+mx+n=0$ have a common root. Let a, b and a, c be the roots of the respective equations, then we have—

$$a+b=-5, \qquad a+c=-m,$$
$$ab=4, \qquad ac=n.$$

Now had the four roots been different, we should have had *four* equations from which to find them ; but, as it is, we have four equations from which to find *three* unknowns. That is, we can find a, b, c from any three of the above equations, and by putting their values into the fourth we shall obtain a result free from a, b, c. We shall, in fact, obtain $(n-m+1)(n-4m+16)=0$. This is still left as an exercise for the student.

Solution to Ex. 35 (*October*): $ax=ax+c$ can be written $a=a+\frac{c}{x}$, and hence $\frac{c}{x}=0$, and therefore x is *infinite*.

Work the following examples:—

40. Given that $2\{x^2+y^2-x-y\}+1=0$, find x and y.
Ans. $\frac{1}{2}$, $\frac{1}{2}$.

41. Show, by using the Binomial Theorem, that

$$\frac{\sqrt{1+x}+\sqrt[3]{(1-x)^2}}{1+x+\sqrt{1+x}}=1-\frac{5}{6}x \text{ nearly,}$$

if x be very small compared with 1.

42. Write down the n^{th} terms of the series—
(1) $1+\frac{1}{3}+\frac{1}{5}+\frac{1}{10}+\ldots\ldots$
(2) $\frac{3}{5}+\frac{9}{8}+\frac{27}{11}+\frac{243}{14}+\ldots\ldots$
Ans. $\frac{1}{\frac{1}{2}n(n+1)}$; $\frac{3^n}{3n+2}$.

43. $1^3=1$, $2^3=3+5$, $3^3=7+9+11$, etc. Write down n^3 after the same law.

44. Write down the first three terms of the series whose $(n+1)^{\text{th}}$ term $\frac{(n+7)(n-5)}{(n+1)(n^2+1)}.2^n$.
Ans. $-35-16-7\frac{1}{5}$.

45. If x be very nearly equal to 1, show that

$$\frac{m(x^m-nx^n)}{m-n}=x^{m+n} \text{ nearly.}$$

46. Prove that $(20+\sqrt{392})^{\frac{1}{3}}+(20-\sqrt{392})^{\frac{1}{3}}=4$.

Trigonometry.

Solution of Ex. 33 (*October*).—Denote the corners of the polygon by A_1, A_2, A_3.....A_n, then we require to find S, where

$$S=A_1A_2+A_1A_3+A_1A_4+\ldots\ldots A_1A_n.$$

Now—

$$A_1A_2=2R\sin\frac{\pi}{n},\ A_1A_3=2R\sin\frac{2\pi}{n},$$

and so on as far as $A_1A_n=2R\sin\frac{(n-1)\pi}{n}$, where R is the radius of the circumscribing circle.

Hence—

$$S=2R\left[\sin\frac{\pi}{n}+\sin\frac{2\pi}{n}+\ldots\ldots\sin\frac{(n-1)\pi}{n}\right]$$
$$=2R\sin\frac{\pi}{2}.\sin\frac{(n-1)\pi}{2n}\div\sin\frac{\pi}{2n}$$

by the method explained last month.

Since $R=a\operatorname{cosec}\frac{\pi}{n}$,

$$S=\frac{2a\sin\frac{(n-1)\pi}{2n}}{\sin\frac{\pi}{n}.\sin\frac{\pi}{2n}}=\frac{2a\cos\frac{\pi}{2n}}{\sin\frac{\pi}{n}.\sin\frac{\pi}{2n}}$$
$$=a\operatorname{cosec}^2\frac{\pi}{2n}.$$

Work the following examples :—

34. If $\sin A=\frac{3}{5}$, $\sin B=\frac{12}{13}$, and $\sin C=\frac{7}{25}$, where A, B, and C are positive angles less than 90°, find $\sin(A+B+C)$.
Ans. $\frac{3}{65}$.

35. Show that $\sin^2 24°-\sin^2 6°=\frac{\sqrt{5}-1}{8}$.

36. If $\cos A=\frac{40}{41}$ and $\cos B=\frac{60}{61}$, where A and B are angles less than a right angle, show that

$$\sin^2\frac{A-B}{2}=\frac{1}{41\times 61}.$$

37. Show that $(\cos\theta+\sin\theta)(\cos 2\theta+\sin 2\theta)=\cos\theta+\cos\left(3\theta-\frac{\pi}{2}\right)$.

38. Among all the values of θ between 0 and π, find that which makes $\sin\theta.\cos(\beta-\theta)$ greatest ; β being a given angle between 0 and $\frac{\pi}{2}$.
Ans. $\theta=\frac{\beta}{2}+\frac{\pi}{4}$.

39. Eliminate θ from the equations—
$m\sin 2\theta=n\sin\theta$, $p\cos 2\theta=q\cos\theta$.
Ans. $p(n^2-2m^2)=qmn$.

40. Show that—

$$\left(x-2\cos\frac{2\pi}{7}\right)\left(x-2\cos\frac{4\pi}{7}\right)\left(x-2\cos\frac{6\pi}{7}\right)$$
$$=x^3+x^2-2x-1.$$

BOOKS RECOMMENDED FOR STAGES 2 AND 3 MATHEMATICS.

Stage 2.

Algebra.—Hamblin Smith's, or Hall and Knight's small book (Macmillan).

Trigonometry.—Hamblin Smith's, Lock's (Macmillan), or Loney's (Cambridge Press).

Euclid.—Any Euclid, containing Books I., II., III.

Stage 3.

Algebra.—Todhunter's or Hall and Knight's larger books (Macmillan).

Trigonometry.—Todhunter's or Loney's.

Euclid.—Nixon's Euclid, Revised, is a good one (Clarendon Press).

A NEW SOPORIFIC.—Pellotine, the alkaloid obtained from *Anhalonium Williamsi* by Heffler, has recently been discovered to be a useful soporific. Experiments conducted by Jolly in one of the Berlin hospitals show that a dose of six centigrammes rapidly produces sleep, which lasts for several hours. No disagreeable results follow. When injected the dose is from two to four centigrammes. The formula $C_3H_{15}NO_3$ represents the composition of pellotine.

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FRUGIVOROUS BATS.—In a recent bulletin of the Trinidad Botanic Gardens Mr. Hart reports that considerable damage is done by bats to fruit trees. A small heap of fruit is frequently found under their feeding place, which is generally the under side of some branch of a tree. Early in the morning, before other animals disperse these heaps, rare seeds and fruits may often be obtained in this way. The seeds are often conveyed a mile from the place where they originally grew.

ADVANCED AND HONOURS PHYSIOGRAPHY.

I.

ANSWERS TO THE SECOND OR ADVANCED STAGE, 1896.

SECTION III.

25. State the methods by which the rotation and revolution of the earth have been demonstrated.

The methods by which the rotation of the earth has been demonstrated are—

(1) By dropping a body from a great height, when it deviates towards the east. (2) By Foncault's pendulum. (3) By Foncault's gyroscope. For details of these see pages 120–23 of 'Elementary Physiography.'

Revolution is proved by (1) aberration of light, (2) by the annual parallax of fixed stars. For these see pages 130 and 133 of 'Elementary Physiography.'

26. How has the depth of the ocean, the nature of the ocean bottom, and the temperature and chemical composition of ocean water at different depths been ascertained?

Depth and configuration of bottom have been ascertained by means of the sounding rod, the 'Hydra' form of which is described on page 259 of 'Elementary Physiography.'

Temperature has been ascertained by self-registering deep-sea thermometers. Negretti and Zambra's form is figured and explained on pages 269–71 of 'Elementary Physiography.'

The chemical composition of the water at various depths is demonstrated by obtaining specimens by means of the Hydra sounding-rod, and by evaporating and afterwards analysing and weighing the solids remaining after evaporation.

SECTION IV.

27. State what is meant by the 'dew-point,' and describe a dew-point hygrometer. How are observations made with this instrument, and what deductions can be drawn from the results of those observations?

Dew-point is the temperature at which the air is saturated with moisture. To estimate this it is necessary to cool some portion of the atmosphere down sufficiently for its moisture (or dew) to be deposited.

The instrument most commonly used for this purpose is the wet and dry bulb thermometer, which is figured on page 306 of 'Elementary Physiography.' It consists of two thermometers fixed on the same stand, the bulb of one being covered with muslin, the other being open to the air. Beneath the covered bulb is a vessel containing water into which dip some threads from the muslin. By capillary attraction these threads draw up the water and moisten the muslin. This water on the bulb evaporates, and in so doing extracts heat from the mercury in the covered bulb, and so causes the temperature in the vicinity of this bulb to be lowered. This will continue so long as the air can take up moisture from the bulb, and ceases so soon as the air is saturated, so that when the mercury of the thermometer, whose bulb is covered no longer descends, dew-point has been reached. If the uncovered thermometer registers 15° C., and the temperature of the other be 6° C., the meaning of this is that when the atmosphere under these conditions is cooled down to 6° C. dew will be deposited.

From the result of observations made with this instrumemt it is apparent (1) that the capacity of air for moisture depends upon its temperature, so that if air saturated with moisture be heated it is no longer saturated. (2) That a still atmosphere is necessary to dew deposition, for when currents of air are allowed to exist near the muslin bulb dew is not deposited, because the air is not cooled down sufficiently.

28. What is a 'Geyser,' and in what respects does a geyser resemble a volcano? State the points in which geysers resemble and differ from volcanoes and ordinary hot springs respectively.

Geysers are eruptive fountains of hot water and steam. They resemble volcanoes in so far as they are eruptive, that they are due to the action of superheated water which suddenly finds vent, that they are the means of carrying mineral matter from the interior of the earth, and depositing it either round the vent or in layers at a distance away from it. Like volcanoes also they are intermittent, and have a close connection with earthquakes. They differ from volcanoes in the nature of the ejectamenta, which in the case of geysers consist only of water containing silica, carbonates,&c., in solution, whereas the ejected material in the case of the volcano consists of portions of rocks, lava, water, steam, and various gases. They differ also in that the eruptions are not so infrequent nor yet so violent as in the case of a volcanic eruption.

Hot water springs resemble geysers in that they deposit silica as sinter, and calcium carbonate as calcareous tufa. Hot water springs differ in being, as a rule, continuous and not intermittent, and in being non-eruptive, but quietly emerging flows, they being in reality ordinary springs which have flowed through a heated area, and have had their solvent power greatly increased thereby.

In most cases the geyser is the successor of the volcano, and is an indication of declining volcanic energy, which, formerly able to eject dust, lava, &c., now suffices only to eject water.

In like manner the hot spring would indicate complete quiescence of volcanic energy.

SECTION V.

29. Describe three common types of each of the following:—(*a*) Volcanic rocks, (*b*) aqueous rocks, (*c*) plutonic rocks, (*d*) metamorphic rocks.

(*a*) Volcanic.

(1) Obsidian, a glassy rock exhibiting no crystalline structure, consists of felspar (orthoclase), quartz, and mica, and has from 70 to 75 per cent. of silica in its composition, and is therefore an acidic rock. Its glassy structure is due to very rapid cooling.

(2) Ardesite is an intermediate volcanic rock. It is cryptocrystalline, *i.e.*, it has small imperfect crystals interspersed through vitreous or glassy matter. It has about 60 per cent. of silica, and consists of orthoclase, felspar, and hornblende.

(3) Basalt is one of the best known of volcanic rocks. It is a basic rock, having not more than 50 per cent. of silica, and a correspondingly high percentage of basic oxides. Its minerals are augite, plagioclase, magnetite, and more or less olivine. In structure it is cryptocrystalline, *i.e.*, it consists of very small crystals interspersed with vitreous or non-crystalline material. This indicates somewhat rapid cooling. It has a high specific gravity (2·7 to 3), and is mostly of a black colour. Giants' Causeway and Fingal's Cave consist of columnar basalt.

(*b*) Aqueous.

(1) Siliceous conglomerate. This is a mechanically formed siliceous rock, consisting of rounded masses of silica cemented together by a siliceous matrix.

(2) Shale. This is a mechanically formed argillaceous rock, which has been laid down as mud by rivers and has been indurated by pressure and afterwards raised by slow movements of upheaval.

(3) Oolitic limestone. This is an organically formed calcareous rock, consisting of small rounded, roe-like masses in a matrix of calcium carbonate.

Flint is a chemically formed siliceous rock.

(*c*) Plutonic.

(1) Granite. This wholly crystalline rock is one of the best known of all rocks. It consists of orthoclase, felspar, quartz, and mica, and has 75 per cent. of silica, thus belonging to the acid class of igneous rocks. There are several varieties.

(2) Syenite is a granite rock consisting of orthoclase and hornblende. It contains about 60 per cent. of silica, and is therefore intermediate with respect to this feature. It is frequently used for road metal.

(3) Gabbro. This is the best known variety of basic plutonic rock. It is therefore crystalline, and consists of augite, plagioclase, magnetite, and olivine.

(*d*) Metamorphic.

(1) Gneiss. The composition of this rock is the same as that of granite, its minerals being felspar (orthoclase), quartz, and mica. Its characteristic is the arrangement of these minerals in folia, giving it a schistose character due to regional metamorphism. It is an acidic rock.

(2) Mica schist. With respect to structure this rock resembles gneiss in that it exhibits foliation, its successive layers consisting of mica (Muscovite) and quartz.

(3) Slate. Unlike the above two, slate is an altered aqueous rock, the stages in its development being mud, shale, slate. It is thus an argillaceous or clayey rock. It splits in laminæ along totally different directions from the lines of stratification.

30. Give an account of the manner in which calcareous rocks are formed by the action of plants and animals.

The general principle referred to here is as follows:—Certain plants and animals inhabiting the sea have hard parts composed of calcium carbonate. This they are able to secrete from the waters of the ocean. When they die their hard parts fall to the bottom of the ocean, and form the oozes which are so widespread beyond the region of shore deposits. Each successive layer tends to indurate preceding deposits, and upon upheaval these deposits constitute rocks closely resembling chalk. The organisms known to be concerned in this work are as follows:—

(*a*) Plants. Certain of the algæ, to whom are perhaps due the coccoliths and coccospheres.

(*b*) Animals. (1) Radiolaria, especially the genus Globigerina, of which the oozes closely resembling chalk are mainly formed. (2) Coral polyps. These zoophytes form a calcareous exoskeleton of radiating partitions. As the polyp mounts upwards this calcareous formation increases in height. With the increase of the polyp by breeding the further increase of calcareous deposit follows, so that, under favourable conditions of growth, vast quantities accumulate. The coral is broken up by the action of the sea and redeposited in layers to form coral limestone, which by the accidental deposit of material upon the coral reef eventually develops into a coral island.

Encrinital limestone is a mixture of encrinites, foraminifera, coral, and molluscs. Shell limestone has shell fragments embedded in a matrix of calcium carbonate. In these cases a cement of limestone has joined together the masses of shells, &c., which give the limestone its characteristic appearance.

These notes will aim at assisting students of each of the four stages of Physiography; especially will an attempt be made to summarise recent work in Geology, Astronomy and Meteorology, in so far as these sciences come under the scope of Physiography.

BOOKS.

Section I.—This, the latest production of the South Kensington syllabus manufacturers, is a compound of many simples. At present no book exactly covering this syllabus has been issued. However, we are able to announce that Mr. Thos. Cartwright, B.A., B.Sc., has such a book in active preparation, which will discuss the syllabus from the point of view of the departmental experiments, all of which are included in the body of the work. Until this book appears we recommend a study of those parts of Gregory's Physiography that bear upon the syllabus.

Elementary.—No better book for this stage than Gregory's can be recommended; the student, therefore, should carefully go over this encyclopædic little book.

Advanced.—A new edition of Gregory's Advanced Physiography, with sections treating of the new matter given under this head in the Department's Syllabus, is just being issued. Taken in conjunction with the Elementary work, which deals exhaustively with some of the advanced matter, this book can be thoroughly relied upon to completely cover the ground.

Honours.—Here the task of recommending books becomes a very difficult one. Gregory's 'Honours Physiography,' written in collaboration with Mr. H. G. Wells, does not pretend to cover the Honours Syllabus. Still, it is a very suggestive book, and should be diligently studied with the conviction that it contains no word of which the Honours student can be safely ignorant. The Rev. Osmund Fisher's 'Physics of the Earth's Crust,' is still regarded as the most eminent authority upon this part of the subject, and should be carefully read. Waldo's 'Modern Meteorology' (Walter Scott), is a cheap suggestive little book, that by W. M. Davis (Arnold) is also reliable. The 'Physical Geograpy of the Sea,' by Maury (Nelson, 4s.), is likewise a good book. For general descriptive Astronomy, Young's 'General Astronomy' (Gunn & Co.) is still *facile princeps*, whilst on the Ice Age, Sir Robt. Ball's book (Walter Scott) is very readable and suggestive. Any good modern book on Geology will do to give the student that knowledge of Geology (excluding paleontology and stratigraphy) needed to satisfy Messrs. Judd and Lockyer, whose books, by the way, especially the Elementary Astronomy of the latter (Macmillan), and that on Volcanoes (Kegan Paul) by the former, should be by no means omitted from the student's list of needful books.

So far as concerns periodical literature, the student has a wide choice. Here, however, it is that we may perhaps come most welcomely to his aid, and it will therefore be the aim of these notes to put forward new developments of the science as chronicled in the pages of the journals devoting themselves to this branch of scientific literature.

Nature, *Knowledge*, and the *Geological and Astronomical Magazines*, are the journals most likely to aid in this connection.

If, therefore, the Honours student gets well acquainted with the books afore-mentioned, and, in addition, follows well the points put forward from time to time in this place, he may hope to achieve success in Honours Physiography.

(*To be continued.*)

For want of space the following contributions are held over, and will appear in our next number:—Dr. Green's 'Elementary Lessons in Agricultural Zoology,' P.T.'s Library Notice, Mr. Ellery's 'Problems in Arithmetic,' 'Visit of Instruction,' Miss Dodd's 'Lessons for Criticism Classes,' Illustrated Interviews with Mr. Seth Coward and Mr. W. L. Dowding.

NOTES ON THEORETICAL MECHANICS.

ADVANCED AND HONOURS STAGES.

BY F. CASTLE, M.I.M.E.

Royal College of Science; Lecturer in Mechanics, Geometry, etc., Morley College, London.

23. A body acted on by a constant force is moving at the rate of 12 feet a second, and in the next 10 seconds it describes a distance of 470 ft.; what velocity does it gain in each second of its motion, or in other words, what is the acceleration f?

Ans. $f = 7$ per sec.

($V = 12$, $t = 10$, $s = 470$, $\therefore 470 = 12 \times 10 + \frac{1}{2} f \times 10^2$ gives $f = 7$.)

24. A body has at a certain instant a velocity of 22 ft. per sec.; in the following minute it describes 10,320 ft.; find the constant acceleration. Ans. 5.

25. If a body falling freely describes a distance of 30 yards in half a second, what was its velocity at the beginning of the half second? ($g = 32$.) Ans. 172.

($s = 90$, $f = 32$, $t = \frac{1}{2}$; $\therefore 90 = V \times \frac{1}{2} + \frac{1}{2} \times 32 \times (\frac{1}{2})^2$ gives $V = 172$.)

26. If the increase of velocity in any second is 20 ft. per sec., and the body describes 450 feet in 5 seconds, what was its velocity at the beginning of the first second? (1896.) Ans. 40 ft. per sec.

27. A body is thrown upward from the top of a tower with a velocity of 48 ft. per sec; find where it will be at the end of 4 seconds. ($g = 32$). (1895.)

Ans. 64 ft. below point of projection.

The two equations $v = V + ft$ (1), and $s = Vt + \frac{1}{2} ft^2$ (2), are very important, and should be carefully made out and remembered. Another important equation is deduced from (1) and (2) by eliminating t; to do this, square eq. (1), $\therefore v^2 = V^2 + 2Vft + f^2t^2$ (4), multiply eq. (2) by $2f$, $\therefore 2fs = 2Vft + f^2t^2$ (5), now substract eq. (5) from (4), $\therefore v^2 - 2fs = V^2$, or $v^2 = V^2 + 2fs$ (3), using the negative sign for f, $v^2 = V^2 - 2fs$.

If the initial velocity be zero (the body starting from rest), $V = 0$, and the equations become $v = ft$, $s = \frac{1}{2} ft^2$, $v^2 = 2fs$.

In the case of a body falling freely, neglecting the resistance of the atmosphere, the body gains a velocity of 32·2 ft. per sec. in every second of its motion (this is denoted by the letter g; as previously shown, the value of g varies slightly with the latitude of the place, and also with the height above sea-level), hence when a body is allowed to fall freely for a time t, or through a height h, the equations become $v = gt$, $h = \frac{1}{2} gt^2$, $v^2 = 2gh$.

Multiplying each side of the last equation by W and arranging we get $\frac{1W}{2g} v^2 = Wh$. (6)

The expression on the left-hand side gives the kinetic energy of a body of weight W, moving with a velocity v; the expression Wh on the right, the potential energy, or energy of position of a body of weight W, raised to a height h.

Eq. (6) may be written as $\frac{Wv^2}{2g} = F \times s$, where F denotes the force in pounds, and s the distance in feet through which F is made to act; there is no ambiguity here when it is remembered that a 'force of 20 pounds' denotes a force equal to the weight of 20 pounds, and would be written simply as 20 lbs.

Since the mass of a body is its weight in pounds, divided by 'g' or 32·2, the equation may be written as $\frac{1}{2} Mv^2 = F \times s$, where M is the mass of the body in pounds, v the velocity in feet per sec., F the average force exerted in poundals, and s the space in feet.

28. A body of mass 6 lbs., is moving at the rate of 8 ft. per sec.; find its kinetic energy. If 117 foot-poundals of work are done against a resistance, what will then be its velocity?

Ans. 192; 5 ft. per sec.

29. A bullet, moving at the rate of 1,100 ft. per sec., passes through a thin plank, and comes out with a velocity of 1,000 ft. per sec.; if it then passes through another plank exactly like the former, with what velocity will it come out of this second plank? (1895.)

Ans. 888·89 ft. per sec.

30. A particle, whose mass is 10 lbs., moves from rest along a straight line under the action of a force of 80 poundals; find its velocity when it has described 50 feet. (1896.)

Ans. 28·3 ft. per sec.

31. Write down the formula for the kinetic energy of a particle of given mass moving with a given velocity.

If the mass of a particle is 1·8 ounces, and it is moving at the rate of 1,500 feet a minute, how many foot-poundals of work can it do against a resistance in virtue of its mass and velocity? (1896.)

Ans. 126,100.

32. A body, mass 20 lbs., is moving against a constant resistance F; at a certain point it is moving at 18 ft. per sec.; after moving over 50 feet, its velocity is reduced to 10 ft. per sec.; find F and loss in kinetic energy. Ans. 44·8; 2240.

33. A body, mass 5 lbs., falls freely through 10 feet, what energy does it acquire? Ans. 1,600 foot-poundals.

If instead of falling freely, the mass of 5 lbs. has to draw up a mass of 3 lbs. by means of a thread, to which the masses are attached, and which passes over a smooth point, find the kinetic energy acquired by the mass of 5 lbs. in falling 20 feet. ($g = 32$.)

Ans. 1,280.

($5 \times 20 \times 32 - 3 \times 20 \times 32 = 1{,}280$ foot-poundals.)

34. The head of a steam hammer weighs 10 cwt., and has a fall of 8 feet. If it indents the iron on which it falls by 1 inch, find the mean force exerted on the iron during compression.

Ans. 48 tons.

35. A fly-wheel weighs 2½ tons, and its mean rim has a velocity of 40 ft. per sec. If the wheel gives out 10,000 foot-pounds of energy, how much is its velocity diminished?

Ans. 1·45 ft. per sec.

In a preceding article it has been been shown that if a force F act on a body of mass M, the resulting motion is given by the equation $F = Mf$, where f denotes the acceleration, F being the force in *poundals*, or in absolute units, and M the mass of the body in pounds.

If t denotes the time during which the force F is acting, then $F \times t = Mv$. Mv, denoting the product of the mass and the velocity, is called the *momentum* of the body (formerly called the 'quantity of motion'), Ft, the *impulse of the force*.

This important formula, as already explained, is obtained directly from Newton's second law of motion, 'change of motion is proportional to the impressed force.'

When the time is one second, then *force* is *momentum per second*.

In many cases—as in impact, etc.—the time during which a force acts is too short to be measured, the impulse is then measured by the momentum produced or destroyed.

36. The head of a steam hammer weighs 2½ tons, and has a fall of 5 feet. What will be the average force exerted during a blow from this hammer if the duration of the blow be $\frac{1}{10}$ second.

Ans. 113 tons.

37. A mass of 10 tons is moving at 20 ft. per sec., find mean force to reduce it to rest in ½ second. Ans. 42,000 lbs.

38. If the kinetic energy of a mass of 10 tons be 40 foot-tons, find the velocity, and the distance through which it moves before being brought to rest by a mean resistance of 250 tons.

Ans. 16 ft. per sec.; 1·92 inches.

List of Works Suitable for Theoretical Mechanics.

Advanced Solids.—'Elementary Dynamics,' by Loney (Cambridge University Press); 'Elementary Statics,' by Loney (Cambridge University Press); 'Elementary Dynamics,' by Hicks (Macmillan).

Advanced Fluids.—'Hydrostatics and Pneumatics,' by Pinkerton (Blackie); 'Hydrostatics,' by Besant (Deighton, Bell & Co.).

For both Solids and Fluids.—'Theoretical Mechanics,' by Twisden (Longmans).

Honours.—'Dynamics,' by Williamson and Tarleton (Longmans); 'Hydrostatics,' by Greenhill (Macmillan).

Also refer to 'Practical Mechanics' and 'Theoretical Mechanics,' by Twisden.

SCIENCE NOTES.

A New Galvanic Cell.—Dr. W. W. Jacques has recently devised a new cell for the production of electricity as a direct result of the consumption of carbon. A carbon rod, or cylinder, is suspended in an iron pot containing caustic soda, the rod and the pot consequently constituting the poles. The cell having been placed in a suitable furnace, in order that the caustic soda may be brought to a temperature of from four to five hundred degrees Centigrade, air is then forced through the soda by means of an air pump. Oxygen is taken up from the air and attacks the carbon, which is gradually consumed, an electric current being produced as a result of the action. The efficiency of the cell is said to be about 85 to 90 per cent. Commercial caustic soda can be used, and gas carbon, or charcoal, can be employed for the rod without special treatment.

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A New Element, Lucium.—P. Barrière claims to have discovered a new elementary body, to which he gives the name of *lucium*, and it is proposed to use this supposed new element for the production of an incandescent gas light. Lucium is said to dissolve in sulphuric, nitric, and acetic acids, forming white or slightly rose tinted salts, all of which are soluble in water, and form with it limpid colourless solutions. These salts do not form insoluble double salts with sodium sulphate, as do the salts of cerium, lanthanum, and didymium, nor with potassium sulphate, as is the case with thorium and zirconium. Sodium thiosulphate precipitates lucium chloride, but not ytrium, ytterbium, or erbium, whilst lucium differs from glucinum by its salts being precipitable by oxalic acid. The atomic weight of the new element is calculated as equal to 104, and its spectral rays are special, only approximating slightly to those of erbium.

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Poisoning from Wood Smoke.—A curious case of lead poisoning occasioned by wood smoke is reported by Charrier. Two persons were attacked with colic and other characteristic symptoms after burning in a pipe stove a quantity of old painted wood taken from demolished houses. This recalls a case noted by Vulpian, where an epidemic of colic was produced in a Parisian quarter by a baker using a quantity of painted wood to heat his oven.

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Argon and Recent Research.—Villard reports that he has combined water with argon to form a crystalline hydrate analogous to those formed by other gases. When the gas was subjected to a pressure of about a hundred and fifty atmospheres, in presence of water at a temperature of zero Centigrade, crystallisation was caused locally by cooling a portion of the tube. M. Schloesing has succeeded in proving the existence of argon in fire damp and in the gas evolved in the mines of Rochabelle. Bouchard and Troost have found argon along with helium in the mineral waters of Cauterets, and Moureu found them in the waters of Maizières. Argon would seem thus to be as generally distributed in the subterranean regions of the earth as in the atmosphere.

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The Rise of Temperature in Flowers.—At Buitenzorg Herr Kraus has recently been investigating the extent and purpose of the rise of temperature which takes place at the time of flowering within the spathe of various species of *Acaceæ*, *Cycadeæ*, and *Palmæ*. In *Ceratozamia longifolia*, he found that this elevation takes place only during the daytime, the maximum attained being 38·5 C., or 11·7 above that of the air. Similar results were given by *Macrozamia*. Whilst in the *Acaceæ* examined the period of maximum elevation is more variable, it never takes place in the night. The seat of the elevation of temperature in this order is not the reproductive organs themselves, but the club-shaped appendix to the inflorescence. It is accompanied by a rapid consumption of sugar and starch. All the plants in which this rise of temperature occurs are entomophilous, and Dr. Stahl supposes it to be a contrivance for attracting insects to assist in pollination.

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The Chemical Inactivity of the Röntgen Rays.—Only negative results have been yielded by some recent investigations of H. B. Dixon and H. B. Baker as to the effect of X rays on some chemical actions. No combination, either explosive or gradual, occurred when the effect of the rays was tried on mixtures of (1) carbon monoxide and oxygen (dried and moist); (2) hydrogen and

oxygen; (3) carbon monoxide and chlorine; (4) hydrogen and chlorine; (5) hydrogen sulphide and sulphur dioxide (dried). To take the first case—that of the carbon monoxide and oxygen—sparks were passed through the dried mixture while it was exposed to the Röntgen rays, and though each spark produced slight combination in its path, no difference could be detected in its action when the rays were falling on the mixture and when they were not. Nor could any difference be detected in the other cases. Electrolytic experiments also yielded negative results.

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UNFERMENTED WINES AND THE PASTEUR TREATMENT.—The principle of Pasteur's treatment of wine has recently been applied by Professor Müller of Thurgau in Switzerland for the preservation of grape and other fruit juice without fermentation. When the freshly expressed juice is heated in bottles to a temperature of from 60° to 70° C. for a quarter of an hour, the yeast cells and other fermenting agents are rendered inactive. The juice can then be kept in well closed bottles for several years without fermenting. To obtain the juice clear, it must be filtered either immediately after heating the juice, or after the lapse of some time, but in either case the filtered juice must be again heated in bottles to the temperature originally applied. Some grape juice bottled in this way in 1882 is still sound and unfermented.

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THE DISTRIBUTION OF ALKALOIDS AND GLUCOSIDES IN PLANTS.—M. L. Sauvan has recently published some interesting investigations undertaken by him into the distribution of a number of alkaloids and glucosides in the living plant. Strychnine occurs in *Strychnus nux vomica*, and other species of the genus in the cortical parenchyma and liber of the stem and root in both old and young plants, in the parenchyma of the leaves and liber of the veins, and in all the cells both of the embryo and of the endosperm, in the ripe seed, always in their interior. Brucine accompanies strychnine in all the organs where it occurs in the various species of *Strychnus*. It is also present in smaller quantities in the epidermis of the leaf and of the young stem. Curarine is found in various species of *Strychnus*, in the interior of the cortical parenchymatous cells, and in those of the liber, in the root and stem; also in the epidermis of the young stem, and in the cells of the parenchyma, liber and epidermis of the leaf. In *Gelsemium sempervivens* gelsemine was localised in the cortical parenchyma and liber of the root, stem, leaf-stalk, and leaf, also in the pith of the stem. Berberine occurs in *Berberis vulgaris* in the interior of the cells of the cortical parenchyma, liber, cambium, and medullary rays, and in the interior of the walls and of the xylem vessels in the root, in the interior of the cells of the cortical parenchyma, liber, and cambium of the stem, and in all the cells of the embryo and endosperm. The taxine of the yew is found in the parenchymatous and pericyclic cells of the root, but not in the sieve tubes; in the same elements, and also in the pith of the stem; in the epidermis and the pericyclic and liber cells of the leaf, in all the cells of the embryo and endosperm of the seed. Helleborine and helleboreine occur in the same organs, but not usually in the same cells of various species of *Helleborus*. *H. viridis* is the richer in the former, *H. niger* in the latter. Daphnine occurs especially abundantly in the fruit of *Daphne alpina* and *D. gnidium*.

REPLIES TO SCIENCE QUERIES.

Physics.—(*a*) Find the mechanical equivalent of heat necessary to raise the temperature of 200 lbs. of copper (specific heat = ·095) from 0° to 100° C.

Ans. 100° C = 180° F.

Hence the heat required per pound will be 180 × ·095.

∴ Heat required = 200 × 180 × ·095

= 3420 British Thermal Units.

(*b*) 100 litres of CO_2 at 0° C. and 760 mm. pressure, are passed over red-hot charcoal, what will the product measure at 15° C. and 760 mm. pressure?

Ans. $C + CO_2 = 2CO$,

$$\text{Hence volume} = \frac{100 \times 2(273 + 15)}{273}$$

= 211 litres.

Hydro.—There are several good books on the subjects, probably the following will be found most suitable for the Advanced Stage in each subject:—

For 'Solids': 'Theoretical Mechanics' Solids by Thornton (published by Longmans).

For 'Fluids': 'Hydrostatics and Pneumatics,' by Pinkerton (published by Blackie).

Notes on the Advanced Stage 'Solids' are to be found in the current and preceding numbers of the 'PRACTICAL TEACHER.' A good collection of questions, in many cases with solutions, are given, which will enable the student to obtain the necessary practice in solving questions. Solutions to questions in the Advanced Stages for 1894 and 1895 are to be found in the last two volumes of the same journal.

E. E. T.—There is, so far as we can discover, no work published such as you want. Criticism such as you need will be found in works on Ethics and in the Greek Texts with Notes. We should advise you to read a book, such as Bain or Sidgwick, dealing with Ethical systems, and then to write your own criticism after a careful study of the text. We regret that we cannot recommend more definitely on either point.

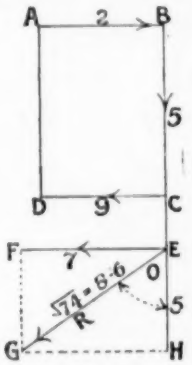
E. C. Waldo's 'Meteorology' (Scott); Fisher's 'Physics of this Earth's Crust' (Macmillan); Young's 'Astronomy'; Ball's 'Ice Age'; Skipton's 'This World of Ours,' by Arnold Foster (Cassell).

Greenock.—Physiography and Chemistry are dealt with in the Science Section for October and for November.

'Mechanics,' Advanced Solids, by Thornton (Longmans); 'Magnetism and Electricity, by Thompson (Macmillan) or Poyser (Longman); 'Navigation,' by Rosser (Imray); 'Naval Architecture,' *see* Collins's List; 'Physiology,' by Dr. Overend (Nelson) or Thornton (Longmans); 'Zoology,' by Marshall and Hurst (Churchill), or Flower and Lyddeker (Black); 'Botany,' by Prante and Vine (Sonnenschein).

Initium.—A rectangle has sides in the ratio of 3 to 4. Forces of 2, 5, and 9 lbs. act along the sides from A to B, B to C, and C to D, respectively. Find the magnitude and direction of resultant by a diagram or otherwise.

SOLUTION.—The unlike parallel forces of 2 and 9 may be replaced by a force of 7 acting at a point E in BC produced such that $EC \times 7 = BC \times 2$.



The force 5 may also be assumed to act at E in BC produced. Hence, at E two forces of 7 and 5 are acting at right angles; if EH = 5 and EF = 7, then, completing the parallelogram and joining E to G, EG is the resultant required, and the angle θ can be measured when $EG = \sqrt{49 + 25} = \sqrt{74} = 8{\cdot}6$,

$$\tan\theta = \tfrac{7}{5}.$$

Todhunter's 'Elementary Mechanics' is not quite sufficient for the Advanced Stage 'Solids,' and is not suitable for the Advanced Stage 'Fluids.' For the former, the 'Notes on Mechanics' to be found in the current and back numbers of the PRACTICAL TEACHER, will help you. For the latter, Besant's 'Elementary Hydrostatics,' published by Deighton, Bell & Co., 4s., or Pinkerton's 'Hydrostatics and Pneumatics,' published by Blackie & Son.

T. M.—For the problem to be possible the planes should be AC and CB, *not* AB and CB as given.

There are *four* forces acting on the beam, namely (1) the reaction (R_1) at B perpendicular to CB; (2) the reaction (R_2) at A perpendicular to AC; (3) the tension (T) at A in the direction AC; (4) the weight acting vertically through the middle of the beam. Resolve each of these vertically and horizontally. The horizontal forces will

then be T and R_1, cos 30°; the vertical forces will be R_2, W, and (R_2 sin 30°). Since the beam neither moves horizontally nor vertically, we must have—

$$T = R_1 \cos 30° = R_1 \cdot \frac{\sqrt{3}}{2},$$

and $R_2 + R_1 \sin 30° = 32$, *i.e.* $R_2 + \frac{R_1}{2} = 32$.

Also, the beam does not *turn*, hence, taking moments about *any* point, say A, we must have—

$$W \frac{l}{2} \cos 30° = R_1 \cdot l \sin 60°, \text{ i.e. } R_1 = 16 \text{ lbs.}$$

R_2 and T are now easily found to be 24 lbs. and $8\sqrt{3}$ lbs. respectively. The above is a *general method*.

Fancy.—Draw OX and OY at right angles to each other, and a circle, centre C and fixed radius r, cutting OX in A and B, and OY in D and E; we thus have an *edge view* of sphere and planes, DE and AB, representing the circular sections.

Let d, c be the co-ordinates of C, then by drawing CA, CD, and perpendiculars from C to the axes we get—

Sum of areas of circles DE, AB $= \pi[r^2 - c^2 + r^2 - d^2]$,

hence $\pi(2r^2 - c^2 - d^2) = \frac{1}{2} \cdot 4\pi r^2 - a$,

$$\therefore \quad d^2 + c^2 = \left\{ \sqrt{\frac{a}{\pi}} \right\}^2.$$

Therefore OC is constant, and hence C moves on a circle round O, which circle is the end view of a cylinder of radius $\sqrt{\frac{a}{\pi}}$, O being the end view of the axis.

L. E. X.—Let O be the centre of the circle and r its radius; draw the diameter BOPA. Assume for the moment that QPR has been correctly found, then we have—

QP . PR = AP . PB (Euc. III. 35);

also PR = 2PQ, from the question;

hence $2QP^2 = AP \cdot PB = (r - OP)(r + OP)$
$= r^2 - OP^2 = PM^2$,

where PM is drawn perpendicular to PO to meet the circle in M. Therefore PQ is equal to the side of a right-angled isosceles triangle whose hypotenuse is equal to PM. From this relation Q may be found.

Since PQ must be greater than PA, and BP greater than PR (Euc. III. 7), then, for it to be possible that PR is double PQ, PB must be *at least* double of PA, which is evidently impossible when OP is less than one-sixth of the radius.

Iago.—

$$2 \cos \tfrac{1}{2} AB \cdot \cos CD = 2 \cos \frac{c}{2} \cdot \cos d$$

$$= 2 \cos \frac{c}{2} [\cos b \cdot \cos \frac{c}{2} + \sin b \cdot \sin \frac{c}{2} \cos A]$$

$$= 2 \cos^2 \frac{c}{2} \cos b + 2 \sin b \sin \frac{c}{2} \cos \frac{c}{2} \cos A$$

$$= \cos b (1 + \cos c) + \sin b \cdot \sin c \cos A$$

$$= \cos b + (\cos b \cos c + \sin b \sin c \cos A)$$

$$= \cos b + \cos a$$

$$= \cos AC + \cos BC.$$

J. B. Baylis.—Draw three rectangular axes OX, OY, OZ, and through O draw lines Oa, Ob, Oc ....., having their lengths, directions, and senses the same as the axes of the couples. Let A, B, C ..... denote the areas of the faces of the polyhedron, and α, β, γ ..... their inclinations to the plane X O Y, then

$Oa = kA$, $Ob = kB$, $OC = kC$, and so on.

Now, the projection of the entire surface of the polyhedron on the plane X O Y is zero. (*See* Thomson and Tait, 'Elements of Natural Philosophy,' Part I., Arts. 446–448.) Hence—

$$A \cos \alpha + B \cos \beta + C \cos \gamma + \ldots\ldots = 0;$$

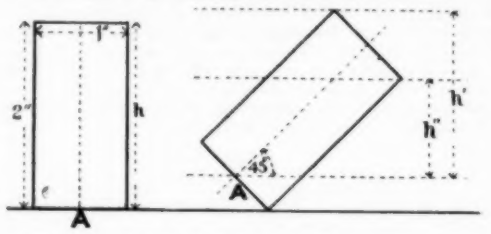
therefore—

$$kA \cos \alpha + kB \cos \beta + kC \cos \gamma + \ldots\ldots = 0;$$

that is, the sum of the components of Oa, Ob, Oc ..... parallel to the axis of z is zero. Similar results are true for the components parallel to the axis of x and y; hence, the body is in equilibrium under the action of the couples.

Mentor.—A cylindrical vessel is 2 ft. high, and its base is 1 foot in diameter; it stands upright, and is filled with water: find the magnitude of the resultant pressure on its base. If now it is tilted so that its axis is inclined at an angle of 45° to the vertical, find the magnitude of the resultant pressure on the base (*a*) when the top is closed, (*b*) when the top is open.

SOLUTION.—In the case of a plane surface immersed in a fluid, the resultant pressure is equal to the total pressure, and its numerical magnitude is obtained by multiplying together the area of the surface, the depth of the centre of gravity of the area, and the weight of unit volume of the liquid.



When the axis is vertical the area of base is

$$1^2 \times \frac{\pi}{4} = \frac{\pi}{4}.$$

Depth of centre of gravity h is 2 ft.; weight of one cub. ft. of water = 62½ lbs.

$$\therefore \text{ pressure on base} = \frac{\pi}{4} \times 2 \times 62\tfrac{1}{2} = 31\tfrac{1}{4}\pi; \text{ or } 98{\cdot}2 \text{ lbs.}$$

$$\left(\text{taking } \pi = \frac{22}{7}\right).$$

(*a*) Axis inclined at 45° and top of cylinder closed, distance of centre of gravity of base from the highest point is h', and is easily found to be $\frac{5\sqrt{2}}{4}$.

$$\therefore \text{ Pressure on base} = \frac{\pi}{4} \times \frac{5\sqrt{2}}{4} \times 62\tfrac{1}{2} \text{ lbs.}$$
$$= 85 \text{ lbs.}$$

(*b*) Axis inclined at 45°, but the top open; distance to centre of gravity is h'', where $h'' = \frac{3\sqrt{2}}{4}$.

$$\therefore \text{ pressure on base} = \frac{\pi}{4} \times \frac{3\sqrt{2}}{4} \times 62\tfrac{1}{2} \text{ lbs.} = 51{\cdot}6 \text{ lbs.}$$

C. H. Coles.—See end of Mr. Baxandall's Mathematics.

J. H. H.—Many thanks. Too late this month.

T. H.—Next issue.

D. Edlltrude.—Answers to Advanced Physiology will appear in our columns very shortly. See end of Dr. Overend's notes.

PRIZE BOOKS.

MESSRS. BLACKIE AND SON.

FIRST NOTICE.

It is most probably unnecessary to remind our readers of the wonderful *répertoire* of prize books issued by this firm. Their fame is world-wide, and there are few Anglo-Saxon boys who are not familiar with the fascinating works of Henty, Dr. Gordon Stables, G. Manville Fenn, C. Whistler, issued from the Old Bailey. The most recent publications are well up to the excellence of their predecessors in clear type, beautiful illustrations, strong and handsome binding, and moderate price.

At Agincourt: a Tale of the White Hoods of Paris. By G. A. Henty.

Mr. Henty's reputation as a writer for boys is well maintained in this story, founded upon the events which preceded 'Agincourt.' A large amount of useful historical knowledge is conveyed to the reader's mind almost unconsciously, so interestingly is it interwoven with the thrilling details of the plot. In the opening chapter, for instance, there comes a pretty picture of life in the Middle Ages, with its predominant feudal castle, the village green frequented by archers, and its chivalrous knighthood. The scene shifts from England to France, which at this time was being devastated by the rival factions of Orleans and Burgundy. Sir Eustace, a French knight who marries an English lady, aided by 200 men, some of whom are English bowmen, bravely defends his castle at Villeroi against an army of 8,000 brought against him by an adherent of Orleans. There is plenty of fighting and heroic adventure, tinged here and there with 'swashbucklerism,' which English boys will highly appreciate. Sir Eustace has a gallant young archer as aide-de-camp in the person of Guy Almer, who is really the hero of the tale, and who, when his lord's wife and children are compelled to

betake themselves to Paris as hostages, aided by Long Tom, a regular William Tell with the bow, some gallant deeds are accomplished. At Paris most of the events recorded take place. Sir Eustace's wife proves herself a strong-minded woman. Massacres and riots occur often in the streets, organised by the butchers and their henchmen attired in white hoods. The heroes and heroines are often in great peril, and are rescued eventually by the aid of a quondam sorcerer in the person of an ostracised Italian Count, whose daughter Guy marries as a finale.

We can thoroughly recommend the book as a wholesome, attractive historical tale. It is well illustrated, and the get up is good.

On the Irawaddy: a Story of the First Burmese War. By G. A. Henty.

Mr. Henty's versatile pen has, in this story, introduced to the notice of English lads a part of the empire about which almost as little is known as of China. Reading such books should enthuse our future citizens with that love of adventure which has been responsible for our success as empire builders. This tale is scarcely as thrilling as others of his we have read, but it has the advantage of being rather more useful than some of his earlier ones. Stanley Brooke, the hero of the story, manages to come in for a good share of adventure. Starting life with his uncle, an Eastern merchant who traded in North Burmah, he very soon found a more congenial occupation as interpreter in a regiment told off for active service in the Burmese War. A large part of the book is taken up with Stanley's doings after he became thus attached to the army. He is taken prisoner and kept at the Burmese capital, but escapes, and is subsequently gazetted. At the close of the war he returns to trading. This is a well-written tale, and is sure of wide popularity.

With Cochrane the Dauntless. By G. A. Henty.

This is an ideal boy's book. Founded, like all of Henty's books are, on a sound basis of fact—and this, to our thinking, is their great charm—it is crammed full of adventure. All British boys are born with a hankering after the sea—which, when it cannot be gratified in reality, is often fed by tales like this one. The sea-dogs who first placed Great Britain in the forefront as a sea-power, sailed the Spanish Main and South American waters, have ever reeked of treasure ships, pirates, and prize money.

Many of our best boys' books are founded upon events which have taken place at sea. This book deserves a place in the front rank of sea tales.

Mr. Henty deserves great praise for immortalising such a gallant Englishman as Lord Cochrane. Such books do a great work in counteracting the cheap blood-and-thunder tales which have a very pernicious effect upon youths. The scene of the story is shifted from the Malay Archipelago to Chili and Brazil.

Altogether, we think this book should be the greatest success of the four. It is, of course, well got up, and there is a fair number of illustrations.

The Young Colonists: a Story of the Zulu and Boer Wars. By G. A. Henty.

This is a very fascinating and up-to-date story. Mr. Henty's delightful way of interweaving fact and fiction is here as beautifully done as ever. There is no stretching after effect, in fact, the tale is simply and naturally told. The heroes are every-day specimens of rural England. In the opening chapter we find the family of the Humphreys living on a large farm in Derbyshire. Incipient consumption threatening Mrs. Humphreys causes the family to emigrate to the Cape. The most interesting characters are Dick Humphreys and Tom Jackson, who rove about the country on the well-known Cape waggons, and meet with no end of fun dodging the Zulus' assegai and the Boers' Martini-Henry. Life in South Africa is graphically described, and the traits of the various native races are brought out. A full account of the Zulu War is given—Isandula, the death of the Prince Imperial, the bravery of 'Bill' Beresford, and the *coup de grâce* of Cetewayo at Ulundi, all come in for a good share of attention. The book finishes up with an account of the Boer insurrection, and our unfortunate defeats at Majuba and Laing's Neck. There is no dry chapter from cover to cover. To those on the look-out for prize books, or for additions to school libraries, we unhesitatingly commend them to 'The Young Colonists.'

Books at 1d. each—

Through the Garden Hedge. By Gregson Gow.
Jack and Jim. By E. King Hall.
The Spectre Ship. By M. Corbett Seymour.
A Big Brave Dog. By M. Corbett Seymour.
That Poor Monkey. By E. King Hall.
The Three Kittens. By E. King Hall.

Books at 2d. each—

The Big Chestnut Horse. By E. King Hall.
The Blotted Copy Book. By Mrs. Bray.
A Brave Deed. By M. Corbett Seymour.
A Ride that Saved a Country. By M. Corbett Seymour.
The Mother's Choice. By Gregson Gow.
Wilful Tom. By Jean Gow.

Books at 3d. each—

The King who was a Cobbler. By M. Corbett Seymour.
Buy Me! By M. Corbett Seymour.
A Perilous Voyage. By Gregson Gow.
Molly's Mistake. By E. Bradshaw Sherwood.
The Raven and the Ring. By Mrs. Gorges.
The Vicar's Little Treat. By Gregson Gow.

These little books are a new departure in prizes. Excellent little tales by well-known writers, in prettily designed cloth covers, they are specially suitable for prizes for junior classes. They are sold in packets of a dozen, at 1s., 2s., and 3s. each respectively. We predict for them an enormous sale.

Books at 6d. each—

The Top Brick of the Chimney. By Jennie Chappell.
A Long Chase. By Geraldine Mockler.
Two is Company. By L. E. Tiddeman.
Big Brother Dick. By Hilda B. Leatham.
When Granny was Young. By the Author of 'Queen of a Day.'

Flix and Flox. By M. Heathcote Statham.

The first of these is a charming storiette, retailing how Roddie got the 'top brick' for his baby sister, and what he found with it. 'A Long Chase' tells how Dolly and Dan followed a gipsy caravan, believing it to contain their stolen baby, and nearly carried off a spaniel by mistake. 'Two is Company' retails the adventure of twins. 'Big Brother Dick,' and his brothers and sisters, had such a good time in the holidays, that most children will envy them. 'When Granny was Young' girls were still girls, and enjoyed themselves in much the same way as they do now, got into similar scrapes, and our of them by similar means. The doings of 'Flix and Flox' in their Cornish home will be followed with delight by all little children who become acquainted with them.

Books at 9d. each—

Merry Nights. By Jean Gow.
In the Gipsies' Van. By Emma Leslie.
The Hollow Tree. By G. Mockler.
The Squire of the Parish. By Mary Bradford Whiting.
Little Lady Bird. By L. E. Tiddeman.

'Merry Nights' is a series of charming tales of animal life. Jack's forced sojourn in the Gipsies' Van taught him many lessons. Edie and Toby went to the Hollow Tree to get a dormouse, were snowed up, and had to spend a couple of days there. This, and how they were ultimately found, is related in a very attractive manner. The very precocious 'Squire of the Parish,' who was aged 10, had a very rough time of it before his Australian cousin succeeded in making him be a boy and not an old man. 'Little Lady Bird' is a very pretty little story of and for girls.

Books at 1s. each—

Lost in Maine Woods. By Isabel Hornibrook.
The Red Umbrella, and other Stories. By Edith King Hall.
Here, There, and Everywhere. By M. Corbett Seymour.
Cynthia's Holiday. By Sheila E. Braine.
Bogie and Fluff. By L. E. Tiddeman.

The adventures and escapades of Burt and Ken in Maine will be eagerly followed by all readers to their edification and amusement. 'The Red Umbrella' is the first of a series of well-told tales, eminently suitable for children. 'Here, There, and Everywhere' follows the wanderings and fortunes of a penny. 'Cynthia's Holiday' in the country, and how she found her way back to her father at a critical time, is a capital book for girls, and 'Bogie and Fluff' is a story of two splendid chums—brother and sister, who had more than their share of adventures and fun.

The 'Saucy May.' By Henry Frith.

This is a capital story of the adventures of a stowaway, his subsequent adventures at sea. The usual dangers and escapes, shipwreck and rescue, are told in a fascinating manner by the author, who evidently knows exactly what boys want, and what is good for them to read. No boy will be willing to put this book down when he has once started on it.

A Chum Worth Having. By Florence Coombe.

This is another splendid tale of boy and girl life; healthy, sensible, and instructive. Vivian is a type of boy to be met with in

most schools, but unfortunately they are not always as amenable as the hero of this tale. A book any boy would be pleased with.

Penelope and the Others. By Amy Walton.

Altogether there were five brothers and sisters, and their plans, and how they managed to carry them out, are told with the usual charm of this well-known authoress. There is not a dull page from cover to cover, and boys and girls will be equally interested in the tale here told.

MESSRS. G. GILL AND SONS.

British Butterflies. By J. W. Tutt, F.E.S.

The accomplished author of this comely volume has produced a work calculated to ensure the gratitude of the whole army of entomologists, and especially to the boyish section. The exposition of the wonderful stages through which the egg passes before we arrive at the developed moth is admirable in its lucidity, nor have we any fault to find with the treatment of the various species of butterflies. Indeed, the only regret we feel after going through the 450 odd pages, is that the many beautiful illustrations are not coloured, which, of course, could not be done at the present price of the book. For a boy smitten with the healthy collector fever, we know of no book more suitable for a prize than this item of Messrs. Gills' 'Hedgerow and Woodland Series.'

MR. JOHN HEYWOOD.

Peasblossom: the Story of a Pet Plant. By Caroline Pridham.

This is an attempt, and a very successful one, to present the simple botanical facts in an interesting manner to young readers, and to instil some enthusiasm for the study of Nature's wonders. The explanations and descriptions are very clear, and are materially assisted by numerous illustrations. The book would prove a welcome and useful prize to any boy or girl.

MESSRS. JARROLD AND SONS.

By the Deep Sea: a Popular Introduction to the Wild Life of the British Shores. By Edward Step, F.L.S.

This well-printed book contains 122 illustrations. It is very neatly bound in a flexible cloth cover, and turned out in handy form suitable for use by holiday ramblers.

We should like to have had an opportunity of calling attention to and recommending the work a month or so ago in one of our special holiday numbers.

To the many of our readers interested in the subject it will prove a veritable Baedeker by the sea-shore. The author states, however, that it is his desire to act as a friendly go-between, introducing the unscientific seaside visitor to a large number of wonderful and interesting creatures of the rocks, the sands, and the shingle beach; for as Mr. Step truly remarks in another chapter there are many persons who go to the seaside every year for several weeks and yet know little of its treasures. Take away from these people the bands, the bathing machines, the itinerant entertainers, the crowds passing to and fro, etc., etc., and they are lonely, miserable, with nothing to occupy their minds.

As a naturalist the author has had much experience in writing for the unscientific. We have gone through these chapters with much pleasure and enjoyment, and think he has succeeded in producing an amount of extremely interesting reading of much value.

The book will make an ideal prize for a senior scholar, and as such it cannot fail to be greatly appreciated. It ought also to find a place among the manuals of popular science in all our Pupil Teachers' Libraries.

Christina's Story. By J. K. H. Denny.

This is a very suitable work for an elder girl. It shows in a very interesting manner how the character of the heroine is disciplined and chastened by severe trials, and how good is thus brought out of seeming evil.

The characters and incidents are numerous enough to furnish an ordinary novel. The story is well managed, and the characters are well drawn, particularly that of the good Aunt Margaret, with her unwavering faith in the existence of good elements in human nature, and in the unfailing mercy of the Almighty. The tendency of the story is decidedly and hopefully religious. Some readers, indeed, may think this feature is made too prominent; but the lessons are carefully and convincingly brought out.

On the Face of the Deep, or the Bird-borne Missive. By William Charles Metcalfe.

What boy-reader does not delight in good sea-stories? Here is one that will be read with keen enjoyment and unflagging interest. The author writes from practical experience of a sailor's life; and he makes the hero, Jack Roper, who tells the story, the subject of many thrilling adventures. He encounters perils of an extreme kind, and his escapes are truly marvellous. There is plenty of nautical slang to supply an amusing element, and a love-story is skilfully woven in with the other incidents, and, needless to say, it ends satisfactorily. The righteous characters triumph, and the villains (and they are unmistakable villains) meet with their deserts.

MESSRS. LONGMANS, GREEN, & CO.

The Animal Story Book. Edited by Andrew Lang.

In Mr. Andrew Lang's annual volume for our young people, the versatile editor takes this year a new departure. After treating them in successive years to several charming series of fairy stories, of true stories, and of poetry, he now presents them 'in return,' as he remarks, 'for a coin or two,' with an admirable selection of stories of animals. In the preparation of the volume he has been ably assisted by Mrs. Lang, Miss Lang, and several other talented ladies and gentlemen.

The tales are drawn from many sources, and abound in interest of varied kind, some being near akin to favorrite fairy fiction, and others derived from the records of careful observers. All, however, are likely to be devoured with eagerness and much relish by children who delight in wonderful adventures, and by those who have a special fondness for animals. Among the most entertaining of the stories must be mentioned those of Baron Wogan, of Alexandre Dumas, and of Theophile Gautier.

'The Animal Story Book' is abundantly illustrated from artistic drawings by Mr. H. J. Ford. These, combined with the tasteful covers of blue and gold, and the generally excellent get-up of the volume, will be sure to make it a favourite gift-book for the coming season.

MESSRS. T. NELSON & SONS.

FIRST NOTICE.

Round the Hearthstone. By Arthur William M. Thayer.

This is a handsomely got up volume, worthy in all respects of its publishers. Its attractions of covers, gilt edges, and splendid print, and nearly 500 pages of reading matter, make it quite an imposing volume. It is only a suitable gift-book for a boy in the sense that 'the boy is father to the man.' It is a book for parents, and consists of over one hundred short and interesting homilies on child training, with copious examples from real life.

There is scarcely a phase of that inexhaustible subject which is not more or less dealt with. One may open the book at almost any page and may be sure of meeting with something to ponder. Special mention may be made of such chapters as those on 'The Mischievous Boy,' 'Things Children do not Learn without being Taught,' 'Can Girls be as Healthy as Boys?' 'A Plea for Stepmothers,' 'How to Make Another Happy,' 'Children and their Pastor,' as containing much sound advice on up-to-date lines.

The author does not claim to have written a *treatise*, only '*hints* to home builders'; 500 pages of *hints* are not bad!

We do not agree with the author in the chapter on 'The discipline of Toys,' in all respects, and we must especially champion the 'game of marbles for *keeps*' as being a training for lads in skill, honesty, concentration, and fortitude under losses, etc. We have never seen any species of gambling to lurk in the innocent marble.

The book should make its way into the hands of everyone who has to do with child-training.

Frank's First Term. By Harold Avery.

Here is a book of 200 pages which is sure to be a favourite with boys. Indeed, the only regret one would feel in putting such a book into a boy's hands is that he would be certain to read it from cover to cover before he laid it down. Frank Westlake, the hero of the book, has been tenderly brought up by a widowed mother, who with two sisters were his sole companions up to the age of fourteen, when by the advice of an uncle he is sent to Stonefield College. What an awakening this proves to be the narrative itself can only tell. One by one he has to face the fiery trials of a big public school, and the ordeal is a terrible one. Frank becomes a hero by his plucky rescue of the school flag, but his want of moral strength brings him into scrape after scrape, and heavy is the penalty which follows his departure from truth, obedience, and honour. Merredith is a fine character, and is the real hero of the tale. The book is written by one who knows boys and wishes them well. Of course, the school boy 'larks' are here as well as his weaknesses, but healthy boys will have no difficulty in detecting where to draw the line between 'fun' and sheer wickedness.

The keynote of the book is to be found in the truth that there is no real virtue except such as can meet and overcome temptation.

Fireside Sketches; Tales of Swedish Life. By Mrs. Woods Baker.

Here are five complete stories compressed into 100 pages. The tales are brightly and crisply told, and there is not a dry page in the

JARROLDS'
HEROIC READERS.

An entirely new Series of School Readers for Boys & Girls.

NEW STYLE. FRESH MATTER.
CLEAR TYPE. MANY ILLUSTRATIONS.

The motto of the Readers is taken from Wolsey's famous speech :—

'Be just, and fear not;
Let all the ends thou aim'st at be thy Country's,
Thy God's, and Truth's.'

The lessons have been drawn from various sources, and include events of very recent occurrence; they have been carefully written, with the object of placing examples of well-doing—physical and moral—before the rising generation, and thereby inculcating a spirit of true heroism calculated to make nobler men and better citizens.

Nos. 1 to 4 contain stories which young children can readily understand and appreciate; while Nos. 5 and 6 give, in connected form, interesting accounts of some of the world's brightest jewels, and tell us on the opening pages that these

'Lives of great men all remind us
We can make *our* lives sublime;
And departing, leave behind us
Footprints on the sands of time.'

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The Cornhill Magazine. London: Smith Elder and Co.

The October number of this excellent monthly is rich in good readable matter. 'Trafalgar from the Spanish Side: an Anniversary Study,' by D. Laird Clowes; 'The Transit of Earl Li'; 'At the Great Dunbar,' by Mrs. F. A. Steel; and contributions likely to be much appreciated by our readers. Mr. W. E. Norris's serial 'Clarissa Furiosa' is still running, and the 'Memoirs of a Soudanese Soldier' are brought to a conclusion.

Four issues of the present series have now appeared, and the new editor is to be congratulated upon the bill of fare offered to his readers.

REVIEWS.

Camps, Quarters, and Casual Places. By Archibald Forbes, LL.D. London: Macmillan and Co., Limited.

Twelve months ago we had the good fortune to notice Mr. Forbes's fascinating volume on the 'Memories and Studies of War and Peace.' Reference was then made to the glow and dash of the author's letters written in the heat of the fray during the progress of the Franco-German war a quarter of a century ago; letters written by a trained soldier wielding a graphic and powerful pen, to the public appreciation of which the London *Daily News* at the time owed so much in being able to spring at a bound into the front rank of the world's newspaper press.

This new volume consists of a second bundle of sketches, several of which have appeared in such magazines as the *Nineteenth Century*, *The Contemporary*, etc. Mr. Forbes does not confine his writings to matters bearing upon the Franco-German War; he treats his readers to chapters on Burmah, Balaclava, Scotland, Cawnpore, Lucknow, Waterloo, etc. The vivid and vigorous style of so brilliant a special correspondent makes everything he writes attractive and fascinating.

'Matrimony under Fire' is the title of the first sketch. At the outbreak of the Franco-German war our author finds himself quartered with officers of the Hohenzollerns at Saarbrücken. One of a small party to arrive at his hotel was

'A plump little girl of about eighteen with a bonny round face and fine frank eyes. She, with her sister and brother, had come from Silesia on rather a strange tryst. Little Minna Vogt had for her Bräutigam a young Feldwebel of the second battalion of the Hohenzollerns. The battalion quartered there was under orders to join its first battalion at Saarbrücken, and young Eckerstein had written to his betrothed to come and meet him there that the marriage-knot might be tied before he should go on a campaign from which he might not return.' . . . . . .

'It was good to see the unrestraint with which Minna—she of the apple face and frank eyes—threw herself round the neck of her betrothed as she met him on the steps of the Hagen Hotel, and his modest manly blush as he returned the embrace. Ye gods! did not we make a night of it.' . . . . . .

'The good old pastor of the snow-white hair and withered cheeks—he had been engaged to perform the ceremony of the morrow. We voted him in the chair whether he would or not; and on his right sat Minna and Eckerstein, their arms interlacing and whispering soft speeches which were not for our ears.' . . . . . .

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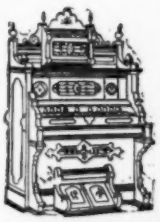

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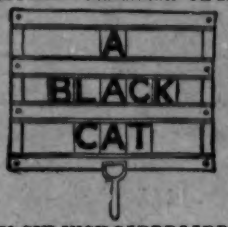

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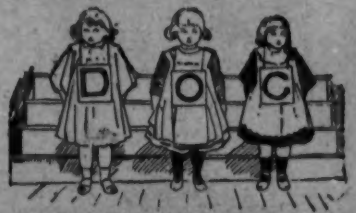

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